



## **Supplementary Conditions**

### 1.0 General

The following supplements shall modify, delete and/or add to the "General Conditions of the Stipulated Price Contract" of the Standard Construction Document – CCDC#2 – 1994. The Supplementary Conditions shall apply to all Work and shall be read in conjunction with the General Conditions of the Contract.

### 1.1 Article A-5 Payment

.1 Article 5.3.1; modify as follows:

...an award by arbitration or court, interest at one percent (1%) per annum above the bank rate...

### 1.2 Article A-6 Receipt of and Addresses for Notices

.1 Article 6.1; modify as follows:

.....or to an officer of the corporation for whom they are intended by hand, by registered post, by facsimile or by email; or if sent by.....

### 1.3 Definitions

.1 Add the following definitions:

#### 21. Completion of the Contract

The Contract shall be deemed to be completed when the price of completion or correction of known defects is not more than the lesser of:

1% of Contract Price, or

\$1,000.00.

#### 22. Total Net Value of Work

Total Net Value of Work is used in Change Orders to determine the mark-up for overhead and profit on the change. Total Net Value of Work means the cost of additional work by the Contractor and all Sub-contractors minus the cost of deducted work, without any mark-ups by Contractors or Sub-contractors.

### 1.4 GC 1.1 Contract Documents

.1 Article 1.1.9.1; modify as follows:

.....shall be

- Supplementary Conditions
- The Agreement between the Owner and the Contractor
- The Definitions
- The General Conditions.....

.2 Article 1.1.9.5; new paragraph as follows:

If detailed standards in the specifications conflict with the specifications, the specifications shall govern. If specifications conflict with specifications, the more stringent specifications shall govern.

.3 Article 1.1.10; delete and insert the following:

The Owner shall provide the Contractor up to 20 sets of the Contract Documents to perform the Work. Additional sets may be purchased from the Consultant, at cost plus mark-up.

### 1.5 GC 2.2 Role of the Consultant

.1 Article 2.2.15; new paragraph as follows:

The Consultant will chair and record the minutes of meetings between the Contractor, the Owner and the Consultant. The Owner and the Consultant reserve the right to make audio tape recordings of the meetings to be used for any future purpose.

1.6 GC 2.3 Review and Inspection of Work

.1 Article 2.3.2; modify as follows:

Delete the phrase "reasonable notice" and replace with "5 Working days notice".

.2 Article 2.3.6; new paragraph as follows:

The Owner shall be permitted temporary or trial use of all equipment supplied under the Contract before Substantial Performance of the Work. The Contractor shall supply all labour and materials required for the temporary or trial use. Any damage or breakdown due to faulty materials or Workmanship shall be made good by the Contractor.

1.7 GC 3.1 Control of the Work

.1 Article 3.1.3; new paragraph as follows:

Upon award of the Contract by either a letter of intent, a purchase order or the signed Contract, whichever comes first, the Contractor shall submit proper bonding, insurance and WSIB clearance prior to entering the site. Within ten (10) working days of award of the Contract the Contractor shall conduct a preconstruction survey of any existing structures with the Consultant and the Owner. It is at the Contractor's discretion to perform any intrusive tests and excavations deemed necessary to confirm the condition of such structures and their foundations. The Contractor shall pay for all costs associated with performing such work, and costs for making good any damage associated with such work. Within ten (10) working days of the survey the Contractor and Consultant shall submit a joint report to the Owner summarizing the results. Issues identified in the report not indicated in the Contract Documents that have cost implications, other than minor imperfections and all construction safety issues, devices or systems, will be dealt with as a change to the Contract. The date the report is submitted the Contractor assumes full responsibility for the site and all existing structures and their foundations, including but not limited to all safety, as per GC 3.6 Construction Safety, and maintenance issues, excluding any unforeseen soil conditions. Any temporary services that are in place are the responsibility of the Contractor in all respects whether shown on the drawings or not. If there is any negligence upon the part of the Contractor in maintaining the site, the Contractor will pay for any costs associated with making good the site and any other matters arising out of such negligence.

.2 Article 3.1.4; new paragraph as follows:

As time is of the essence the Contractor is responsible to carry out all functions in a timely manner to ensure the Work does not incur any unnecessary delays and is performed within the Contract Time.

1.8 GC 3.4 Document Review

.1 Article 3.4.1; modify as follows:

The Contractor shall review the Contract Documents within 10 working days after the date of the Owner's Letter of Intent, or the date of the Purchase Order, and shall report promptly to the Consultant any error, inconsistency, or omission the Contractor may discover.....The Contractor shall not be liable for damage or costs resulting from such errors, inconsistencies, or omissions in the Contract Documents, which the Contractor did not discover within this 10 working day period noted above.....

.2 Article 3.4.2; new paragraph as follows:

The Contractor may submit to the Consultant requests for information, clarification or changes to the Contract. Any requests for information, clarification, or changes to the Contract that are already clearly shown, detailed and/or specified in the Contract Documents, according to the Consultant, will be subject to a charge for the Consultants time at their regular hourly rates plus mark-up payable by the Contractor through a credit to the Contract Price. The Contractor may not submit more than three (3) requests for information per day unless agreed to by the Consultant.

1.9 GC 3.5 Construction Schedule

.1 Article 3.5.1.1; modify as follows:

.....prior to the first application for payment, a critical path construction schedule that indicates manpower loading and timing of the activities of the Work and provides.....

.2 Article 3.5.1.2; modify as follows:

.....and update the schedule on a monthly basis indicating progress of each scheduled line item, changes in manpower loading and any changes required to perform the Work in conformity with the Contract Time; and

.3 Article 3.5.2; new paragraph as follows:

Failure to submit an appropriate critical path schedule, or failure to submit an appropriate updated schedule on a monthly basis may result in the withholding of all progress payments which may be due.

1.10 GC 3.6 Construction Safety

.1 Article 3.6.2; new paragraph as follows:

Any repetitive or flagrant breach of safety legislation will be considered failure to comply with the requirements of the Contract to a substantial degree.

.2 Article 3.6.3; new paragraph as follows:

If the Owner performs work or awards separate contracts for performing work on the site during the Work of the Contract, then the Contractor agrees to become the constructor for the Owner's workers or contractor(s). The Owner agrees to pay a fee, including mark-up, of \$300 per week for up to ten (10) of the Owner's workers or contracted workers, or \$500 per week for over ten (10) of the Owner's workers or contracted workers. The Owner's contractor(s) will provide copies of insurance, WSIB, safety policy, Canadian Construction Association form 1000, WHMIS training, and fall arrest training to the Contractor.

1.11 GC 3.7 Supervisor

.1 Article 3.7.1; modify the second sentence as follows:

The supervisor shall not be changed except for valid reason and as approved by the Consultant and the Owner.

.2 Article 3.7.3; new paragraph as follows:

The Contractor shall replace the supervisor with an equivalent or more competent person, if requested by the Consultant, within 10 working days of the request.

1.12 GC 3.9 Labour and Products

.1 Article 3.9.1; add the following sentence:

The Contractor shall not be entitled to a change in the Contract Price due to any increase in the cost of labour, materials or equipment regardless if the Contract Time is extended or not.

.2 Article 3.9.2; add the following sentences:

All Products which are specified by their proprietary names, part number, or catalogue number are to form the basis for the Tenders. No substitutions allowed. The Contractor may include with his submission alternative prices on a separate sheet of paper from the Tender submission, indicating any effect that the substitution may have on the Contract Price. The Contractor will use all Products in strict accordance with the manufacturer's directions except when specified otherwise.

.3 Article 3.9.4; new paragraph as follows:

Unless submitted in writing with the Tender, no consideration will be given by the Owner to claims by the Contractor of the unsuitability of any Products, nor to the Contractor's unwillingness to use any Products, nor to any relaxation of the requirement to provide good workmanship, nor to the relaxation of the applicable warranties.

1.13 GC 3.11 Shop Drawings

.1 Article 3.11.3; add the following sentence:

When manufacturer's literature is submitted in lieu of scaled shop drawings, clearly mark the item(s) to be reviewed.

.2 Article 3.11.4; delete the second sentence and insert the following:

The Contractor shall prepare a schedule of the dates for submission of all shop drawings no later than 10 Working days after the date of the Owner's Letter of Intent, or the date of the Purchase Order.

.3 Article 3.11.4; add the following sentence:

Failure to submit the shop drawing schedule within the specified period, or failure to submit shop drawings according to the shop drawing schedule may result in the withholding of all progress payments which may be due.

1.14 GC 3.12 Use of the Work

.1 Article 3.12.3; add the following sentences:

The Owner shall have the right to enter and occupy the building in whole or in part for the purpose of placing Products and equipment, or for other use or for other work before completion of the Contract provided that, in the opinion of the Consultant, such entry, occupation or work will not prevent or interfere with the Contractor in the performance of the completion of the Contract. Such entry or occupation will not be considered as acceptance of the Work, or in any way relieve the Contractor from his responsibility to complete the Contract on schedule.

1.15 GC 4.1 Cash Allowance

.1 Article 4.1.4; modify as follows:

Where the total cost for all cash allowance items exceeds the total amount of all cash allowances, the Contractor shall be compensated for any excess incurred and substantiated.....

.2 Article 4.1.5; modify as follows:

The Contract Price shall be adjusted by Change Order to provide for any difference between the total actual cost and the total cash allowance.

1.16 GC 5.1 Financing Information Required of the Owner

Delete this Section in its entirety and all references thereto.

1.17 GC 5.2 Applications for Progress Payment

.1 Article 5.2.6; modify as follows:

.....supported by invoices indicating the quantity, description, and value of the Products. If the Products are not incorporated into the Work, then a copy of the Suppliers invoice showing "Paid in Full", must be attached to the progress claim otherwise the value of these Products may be deducted. Products delivered to the Place of Work are the Contractor's responsibility until built-in.

.2 Article 5.2.7; new paragraph as follows:

The Contractor shall submit with each application for progress payment a Certificate of Clearance from the Workers Safety Insurance Board. In addition, after the first and with each subsequent application for payment, submit a Statutory Declaration that all accounts for labour, subcontracts, Products and services have been paid to the end of the period covered by the preceding applications, and that none of the material on site has been purchased under a conditional sale or any type of hire-purchase agreement.

.3 Article 5.2.8; new paragraph as follows:

Where the specifications indicate a LEED design, a LEED's assessment review will accompany each request for progress payment, and if there are any deficiencies noted by the Consultant, an appropriate amount, as determined by the Consultant, will be deducted from the progress payment and held until the deficiency is corrected. If the deficiency is not corrected on subsequent payments a larger amount may be deducted and held. If the deficiency cannot be corrected, then the deficiency amount may not be returned, but deducted from the Contract Price.

1.18 GC 5.3 Progress Payment

.1 Article 5.3.2; modify as follows:

Delete the phrase "5 days", and replace with "30 days".

1.19 GC 5.4 Substantial Performance of the Work

.1 Article 5.4.3; add the following sentences:

If any defects are corrected after Substantial Performance of the Work the Warranty for the Work, with reference to Products and Workmanship in accordance with GC 12.3 Warranty, will start from the date when such defects are corrected. If a designated portion of the Work is Substantially Performed, the Warranty of that portion of the Work will start from the same date when all defects are corrected.

1.20 GC 5.5 Payment of Holdback Upon Substantial Performance of the Work

.1 Article 5.5.1.3: new paragraph as follows:

submit evidence of compliance with the Construction Lien Act, 1990, regarding advertisements, indicating date of and name of publication etc., with the application for payment of holdback

.2 Article 5.5.1.4: new paragraph as follows:

submit all specified written guarantees, bonds, maintenance manuals, as-built record drawings, certificates, etc., with the application for payment of holdback

.3 Article 5.5.1.5: new paragraph as follows:

submit a Certificate of Clearance from the Workers Safety Insurance Board, with the application for payment of holdback

.4 Article 5.5.3; delete this article and all references thereto.

1.21 GC 5.7 Final Payment

.1 Article 5.7.1; delete and replace with the following:

When the Contractor considers that he has reached the completion of the Work, the Contractor shall submit an application for final payment. In consideration of the completion of the Work, deficiencies or defects will be valued as follows:

- .1 Approved as-built drawings and maintenance manuals (with warranties, extended warranties, sign-off permits including Hydro Inspection Certificate.)

The greater of 0.25% of the Contract Price or \$10,000.

.2 Keys

\$2,000

.3 Clean-up

The greater of 0.1% of the  
Contract Price or \$5,000

.4 Other deficiencies or defects

Value as per Consultant

If the Contractor, directly or indirectly, has the Consultant visit the site to inspect for completion of deficiencies more than two times, then all associated costs for any further deficiency review visits required by the Consultant will be deducted from the Contract Price for payment to the Consultant.

.2 Article 5.7.4; modify as follows:

Delete the phrase "5 days", and replace with "30 days".

## 1.22 GC 5.8 Withholding of Payment

.1 Article 5.8.2; new paragraph as follows:

The Owner may withhold partial payments to cover the cost of any deficiencies as determined by the Consultant. Notwithstanding GC 5.3 Progress Payment, the Owner may withhold all payments as per GC 3.5 Construction Schedule, GC 3.11 Shop Drawings, and GC 6.2 Change Orders.

## 1.23 GC 6.1 Changes

.1 Article 6.1.3; new paragraph as follows:

The Contractor will inform the Bonding Companies of any changes to the Contract so that the Performance Bond still covers the Contract as specified. If any change to the Contract requires adjustments to the Bond, the Contractor is to initiate and pay for the adjustments. Provide proof to the Consultant as requested of the validity of coverage.

## 1.24 GC 6.2 Change Order

.1 Article 6.2.1; add the following sentences:

If the proposed change in the Work will affect the Contract Price or the Contract Time, then the Contractor will provide all quotations detailing the hours of labour, labour rates, payroll burden, itemized materials including quantities and costs, equipment, supervision, overhead & profit. Subcontractors will provide similar information. Mark-ups for overhead and profit (OH&P) will be as per the table below and will be on the *Total Net Value of Work* for the Contractor and all Subcontractors. [Example: Contractor – additional work \$6,000, deduction in work \$2,000, net \$4,000; Subcontractor – additional work \$100,000, deduction in work \$40,000, net \$60,000; *Total Net Value of Work* - \$64,000; Contractor OH&P 7.5% of \$4,000 and 5% of \$60,000; Subcontractor OH&P 7.5% of \$60,000]. The mark-up for overhead shall include, but not be limited to, office space and all associated costs, copying, printing, phones, fax, utilities, toilets, safety costs and flagmen, project management team members, Contractor supervision, benefits, taxes other than Value Added Taxes, all insurance types, bonding, transportation, temporary space and services, hand tools, delivery costs, and permits, fees and licenses. If the change will affect the critical path schedule to extend the date of Substantial Performance as substantiated by Contractor documentation, then the Contractor may add site supervision costs in addition to OH&P. Once a Change Order is signed, no further claims may be made for Contract Price or Contract Time as it relates to that change.

<i>Total Net Value of Work</i>	<b>Contractor</b> mark-up on own work	<b>Subcontractor</b> mark-up on own work	<b>Contractor</b> mark-up on Subcontractor work	<b>Subcontractor</b> mark-up on Subcontractor work
< \$5,000	15%	15%	10%	10%
\$5,000 < \$50,000	10%	10%	5%	5%
\$50,000 and over	7.5%	7.5%	5%	3%

.2 Article 6.2.3; new paragraph as follows:

As time is of the essence, the Contractor must submit a price for a pending Change in a reasonable amount of time as determined by the Consultant, but in no case more than ten (10) working days from the date of receipt. The submission must be complete in all respects as outlined in 6.2.1. If the Consultant requests re-pricing of a Change, the re-pricing must be submitted within two (2) working days. Failure to comply with these requirements may result in withholding all progress payments.

1.25 GC 6.3 Change Directive

.1 Article 6.3.1; modify as follows:

.....Contractor agreeing upon the adjustment in Contract Price and Contract Time, or if the Owner requires a change to be expedited for any reason, the Owner, through the Consultant, shall issue a Change Directive.

.2 Article 6.3.4.2; delete this article and all references thereto.

.3 Article 6.3.4.3; delete this article and all references thereto.

.4 Article 6.3.4.4; delete this article and all references thereto.

.5 Article 6.3.4.8; add the following statement:  
provided they are not due to the negligence of the Contractor.

.6 Article 6.3.4.12; delete this article and all references thereto.

.7 Article 6.3.4.15; delete this article and all references thereto.

.8 Article 6.3.5; add the following sentences:

The final amount of any Change Directive can be adjusted based on the determination of the Consultant. If there is agreement on the adjustment to the Contract Price for the change in the Work, then the value of the Change Directive to perform the work shall be as per the agreed to price.

1.26 GC 6.4 Concealed or Unknown Conditions

.1 Article 6.4.2; add the following sentence:

Fractured bedrock, clay or broken shale is not considered materially different than granular soils.

1.27 GC 6.5 Delays

.1 Article 6.5.3; add the following sentence:

The Contractor shall not be entitled to payment for costs incurred from the settlement of a labour dispute, strike, or lock-out.

.2 Article 6.5.4; add the following sentences:

The notice of delay, notice of potential delay, impact notice or the like, must be accompanied with complete documentation indicating exactly how the critical path schedule will be affected, otherwise no claim for delay will be allowed. The Consultant has 10 Working Days after receipt of the notice to respond before there is consideration for a change to the Contract, however this time may be extended if the Contractor has not complied with Article 3.4.2.

1.28 GC 7.2 Contractor's Right to Stop Work or Terminate the Contract

.1 Article 7.2.3.1; delete this article and all references thereto.



.2 Article 7.2.5; modify as follows:

.....including reasonable profit to the date of termination. The Contractor's entitlement shall be determined on the basis of an evaluation of the Work performed and Products supplied under the Contract in relation to the Contract Price plus any Change Orders or Change Directives, for loss sustained upon Products and construction machinery and equipment, and such other damages as the Contractor may have sustained as a result of the termination of the Contract, all as determined by the Consultant.

1.29 GC 8.2 Negotiation, Mediation, and Arbitration

.1 Article 8.2.9; new paragraph as follows:

Within five days receipt of the notice of arbitration by the responding party under paragraph 8.2.6 the Owner and/or the Contractor may give the Consultant a written notice containing:

- .1 a copy of the notice of arbitration;
- .2 a copy of supplementary conditions 8.29 to 8.2.15 of this Contract, and;
- .3 any claims or issues which the Contractor or the Owner, as the case may be, wishes to raise in relation to the Consultant arising out of the issues in dispute in the arbitration.

.2 Article 8.2.10; new paragraph as follows:

The Owner and the Contractor agree that the Consultant may elect, within ten days of receipt of the notice under paragraph 8.2.9, to become a full party to the arbitration under paragraph 8.2.6 if the Consultant:

- .1 has a vested or contingent financial interest in the outcome of the arbitration;
- .2 give the election of notice to the Owner and the Contractor before the arbitrator is appointed;
- .3 agrees to be a party to the arbitration within the meaning of the rules referred to in paragraph 8.2.6, and;
- .4 agrees to be bound by the arbitral award made in the arbitration.

.3 Article 8.2.11; new paragraph as follows:

If the Consultant is not given the written notice required under paragraph 8.2.9, both the Owner and the Contractor are estopped from pursuing an action, counter claim or other proceeding or making an application against the Consultant arising out of the issues in dispute in the arbitration between the Owner and the Contractor under paragraph 8.2.6.

.4 Article 8.2.12; new paragraph as follows:

If an election is made under paragraph 8.2.10, the Consultant may participate in the appointment of the arbitrator and notwithstanding the rules referred to in paragraph 8.2.6, the time period for reaching agreement on the appointment of the arbitrator shall begin to run from the date the Owner issues or receives a copy of the notice of arbitration.

.5 Article 8.2.13; new paragraph as follows:

The arbitrator in the arbitration in which the Consultant has elected under paragraph 8.2.10 to become a full party may:

- .1 on the application of the Owner or the Contractor, determine whether the Consultant has satisfied the requirements of paragraph 8.2.10, and;
- .2 make any procedural order considered necessary to facilitate the addition of the Consultant as a party to the arbitration.

.6 Article 8.2.14; new paragraph as follows:

The provisions of paragraph 8.2.9 shall apply mutatis mutandis to written notice to be given by the Consultant to any sub-consultant.

.7 Article 8.2.15; new paragraph as follows:

In the event of notice of arbitration given by a Consultant to a sub-consultant, the sub-consultant is not entitled to any election with respect to the proceeding as outlined in 8.2.10, and is deemed to be bound by the arbitration proceeding.

1.30 GC 9.1 Protection of Work and Property

.1 Article 9.1.4; new paragraph as follows:

Where permanent installations or otherwise, such as roads, curbs, sidewalks, boulevards, sod, trees, hydrants, fencing, street lighting, landscaping, buildings or structures, outdoor pools, and other such installed equipment abut, front and/or adjoin the Place of Work, the Contractor shall identify the conditions of same prior to commencement of the Work and record said conditions in such a manner as directed by the Consultant, to indemnify the Owner and the Contractor against subsequent damage which may be alleged by others. Should any damage occur which is attributable to the Contractor, the Contractor shall be responsible to make good such damage at his own expense or pay all costs incurred by others in making good such damage.

1.31 GC 9.3 Toxic and Hazardous Substances and Materials

.1 Article 9.3.3; delete this article and all references thereto.

.2 Article 9.3.8; delete this article and all references thereto.

1.32 GC 10.1 Taxes and Duties

.1 Article 10.1.3; new paragraph as follows:

When prices are computed for GC 6.2 Change Order, or GC 6.3 Change Directive, the Contractor must exclude the Subcontractor's and Supplier's Value Added Taxes from the Contractor's price.

1.33 GC10.2 Laws, Notices, Permits, and Fees

.1 Article 10.2.2; modify the second sentence as follows:

The Contractor shall obtain and pay for permits, licenses, or certificates necessary for the performance of the Work which were in force at the date of bid closing.

1.34 GC 11.1 Insurance

.1 Article 11.1.1.4(3); add the following sentence:

As the Owner may be required to provide, maintain and pay for such insurance for total or partial use of the Work, the Owner may deduct all such payments from the Contract Price in the event that the Contractor was negligent in obtaining Substantial Performance within the specified Contract Time as determined by the Consultant.

1.35 GC 11.2 Bonds

.1 Article 11.2.1; modify the second sentence as follows:

The Contractor shall, prior to commencement of the Work or prior to the signing of the Contract which ever is first, provide to the Owner a Performance Bond and Labour and Material Bond in the amount of 50% of the Contract Price covering faithful performance of the Contract and the payment of all obligations arising thereunder. The premium for the required bond shall be paid by the Contractor.

.2 Article 11.2.3; new paragraph as follows:

The Performance Bond issued by the Surety agrees to repay to the Owner all expenses incurred by the Owner including but not limited to legal fees, additional Consultant fees, security services, heat, and power as a result of its Obliges failure to faithfully perform this Contract whether resulting from the Contractor's bankruptcy or otherwise.

.3 Article 11.2.4; new paragraph as follows:

The Performance Bond shall continue as a guarantee bond for the warranty period and beyond the warranty period until all deficiencies have been completed to the satisfaction of the Consultant.

1.36 GC 12.1 Indemnification

.1 Article 12.1.1; modify the fourth line as follows:

Delete the phrase "provided such claims are:".

.2 Article 12.1.1.1; delete this article and all references thereto.

.3 Article 12.1.1.2; delete this article and all references thereto.

.4 Article 12.1.1.3; delete this article and all references thereto.

1.37 GC 12.3 Warranty

.1 Article 12.3.1; modify the second line as follows:

.....the Work, or from the date when all defects and deficiencies are corrected whichever is later, or those periods specified in the Contract Documents for certain portions of the Work or Products.

.2 Article 12.3.7; new paragraph as follows:

The Contractor shall provide properly executed and signed copies of all Guarantee Bonds, Warranties, and Guarantees containing the Owners name, the name and address of the Project, the date the Guarantee commences, what the Guarantee is covering as per the Specifications, and the signature and seal of the Company issuing the Guarantee countersigned by the Contractor.

Client: City of Guelph

Project: Roof &amp; Heating System Replacement

Evergreen Senior's Centre

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Client: City of Guelph

Project: Roof &amp; Heating System Replacement

Evergreen Senior's Centre

**PART 1 - GENERAL****1.1 DEFINITIONS AND ACRONYMS****.1 Inclusiveness**

- .1 The word "all" has been removed for brevity. The absence of this word in no way limits the scope of the description.
- .2 Lists of products, qualities, or responsibilities may be listed after inclusive statements, for purposes of clarification, or to serve as examples. The absence of list items shall not limit the inclusiveness of such statements.
- .3 The word "including" or "includes" shall be taken to mean "including but not limited to" when used before a list.

**.2 Words and terms used on drawings and in specifications are defined as follows:**

- .1 "Applicable": As appropriate for the particular condition, circumstance or situation.
- .2 "Approve(d)": Approval action shall be limited to the duties and responsibilities of the party giving approval, as stated in the Conditions of Contract. Approvals shall be valid only if obtained in writing and shall not apply to matters regarding the means, methods, techniques, sequences and procedures of construction. Approval shall not relieve Contractor from responsibility to fulfill requirements of Contract Documents.
- .3 "Code": When used in a general sense (e.g., "meet code") refers to all regulatory requirements of authorities having jurisdiction, including "regulation".
- .4 "Configure": Means to complete additional activities required to meet performance or functionality requirements including initialization, jumper and dip switch setting, software parameter selection, programming, testing, commissioning, tuning and adjusting.
- .5 "Directed": Limited to duties and responsibilities of Owner or Engineer as stated in the Conditions of Contract, meaning as instructed by Owner or Engineer, in writing, regarding matters other than the means, methods, techniques, sequences and procedures of construction. Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean "directed by Owner," "directed by Engineer," "requested by Owner," and similar phrases. No implied meaning shall be interpreted to extend the responsibility of Owner, Engineer or other responsible design professional into Contractor's supervision of construction.
- .6 "Equal" or "Equivalent": As determined by Engineer or other responsible design professional as being equivalent, considering such attributes as durability, finish, function, suitability, quality, utility, performance and aesthetic features.
- .7 "Equipment": Refers to products with operating parts, whether motorized or manually operated, that requires connections such as wiring or piping.

Client: City of Guelph

Project: Roof &amp; Heating System Replacement

Evergreen Senior's Centre

- .8 "Furnish": Means supply and deliver to the site, ready for unloading, unpacking, assembly, installation, and similar operations.
- .9 "Indicated": Refers to graphic representations, notes, or schedules on the Drawings, or other Paragraphs or Schedules in the Specifications, and similar requirements in Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the reader locate the reference. There is no limitation on location.
- .10 "Install": Describes operations at the site including the actual unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, configuring and similar operations.
- .11 "Installer": Refers to Contractor or an entity engaged by Contractor, including an employee, subcontractor or sub-subcontractor, for performance of a particular construction activity, including installation, erection, application and similar operations. Installers are required to be experienced in the operations they are engaged to perform.
- .12 "NIC": Not In Contract. Indicates work completed or to be completed under separate contract.
- .13 "OFCL": Owner Furnished Contractor Installed. Indicates materials, products or equipment to be provided under separate contract, and may include field finishing, configuration, and commissioning.
- .14 "Products": Items purchased for incorporation in Work, whether purchased for the Project or taken from previously purchased stock, including materials, equipment, assemblies, fabrications and systems.
- .15 "Proper": As determined by Engineer or other responsible design professional as being proper for Work, excluding matters regarding the means, methods, techniques, sequences and procedures of construction, which are solely Contractor's responsibility to determine.
- .16 "Provide": Means furnish and install, complete and ready for the intended use and effect.
- .17 "Regulation": Includes laws, orders, ordinances, codes, standards, and practices issued by authorities having jurisdiction, as well as rules, practices, conventions and agreements within the construction industry that control performance of Work.
- .18 "Required": Necessary for performance of Work in conformance with the requirements of Contract Documents including:
  - .1 Code and regulatory requirements.
  - .2 Requirements of referenced standards.
  - .3 Duties and responsibilities stated in the Bidding and Contract Documents.
  - .4 Requirements specified or referenced in the Specifications.
  - .5 Notes, schedules and graphic representations on the Drawings.
  - .6 Requirements generally recognized as accepted trade or industry practice.

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- .19 "Selected": As selected by Engineer or other responsible design professional from the full selection of the manufacturer's products, unless specifically limited in Contract Documents to a particular quality, color, texture or price range.
- .20 "Site": Same as "Site of Work" or "Project Site" or "Job Site"; the area or areas or spaces occupied by the Project and including adjacent areas and other related areas occupied or used by Contractor for construction activities, either exclusively or with others performing other construction on the Project. The extent of the Project Site is shown on the Drawings, and may or may not be identical with the description of the land upon which the Project is to be built.
- .21 "Supply": See "Furnish".
- .22 "Work": Construction and related services required to meet intent as indicated on Drawings and in Specifications.
- .3 Abbreviations, Acronyms, Names and Terms: Where acronyms, abbreviations, names and terms are used in Drawings, Specifications or other portions of Contract Documents, they shall mean the recognized name of the trade association, standards-generating organization, publishing organization, authority having jurisdiction or other entity applicable.
  - .1 AABC: Associated Air Balance Council
  - .2 ACG: AABC Commissioning Group
  - .3 AHRI: Air-Conditioning, Heating, and Refrigeration Institute
  - .4 ANSI: American National Standards Institute
  - .5 ASHRAE: American Society of Heating, Refrigerating and Air-Conditioning Engineers
  - .6 ASME: American Society of Mechanical Engineers
  - .7 ASTM: American Society for Testing and Materials International
  - .8 AWS: American Welding Society
  - .9 CGSB: Canadian Government Standards Board
  - .10 CRCA: Chicago Roofing Contractors Association
  - .11 CSA: Canadian Standards Association
  - .12 CWB: Canadian Welding Bureau
  - .13 EC-EPS: Environment Canada, Environmental Protection Service
  - .14 GS: Green Seal
  - .15 IESNA: Illuminating Engineering Society of North America
  - .16 IWFA: International Window Film Association
  - .17 MPI: Master Painters Institute
  - .18 MSS: Manufacturer's Standardization Society of the Valves and Fittings Industry
  - .19 NEBB: National Environmental Balancing Bureau
  - .20 NEMA: National Electrical Manufacturers Association
  - .21 NFPA: National Fire Protection Association
  - .22 NSF: NSF International (formerly National Sanitation Foundation)
  - .23 SCAQMD: South Coast Air Quality Management District
  - .24 SMACNA: Sheet Metal and Air Conditioning Contractors' National Association
  - .25 SSPC: The Society for Protective Coatings
  - .26 TIAC: Thermal Insulation Association of Canada

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- .27 UL: Underwriters Laboratories Inc.
- .28 ULC: Underwriters Laboratories of Canada
- .4 Manufacturers and product names shall be defined in the following order:
  - .1 As generally recognized by industry practice.
  - .2 As determined by Engineer.
- .5 Words, terms and abbreviations not otherwise specifically defined in this Section or in Contract Documents shall be defined in the following order:
  - .1 As described by regulation.
  - .2 As described by reference standards.
  - .3 As described by ASHRAE Handbooks and Appendices.
  - .4 As described in specialty dictionaries including:
    - .1 Dictionary of Architecture and Construction, Latest Edition (Cyril M. Harris, McGraw-Hill Professional).
    - .2 Encyclopedia of Associations, online directory by Thomson Gale, accessible through many public libraries.
  - .5 As customarily defined by industry practice.
  - .6 As customarily defined by trade practice.

## 1.2 WORK INCLUDED IN CONTRACT

- .1 Modified Bituminous Roofing:
  - .1 The complete removal and disposal of all roofing components and/or layers down to the existing structural decking, and the installation of new roofing systems as per specifications and drawings on roof sections A, B and D.
    - .1 **New Roofing System "R1": Roof Sections A and D**  
New Two (2) Ply Modified Bituminous Roofing Membrane  
New 12.7 mm High Density Fibreboard  
New 84 mm Polyisocyanurate Insulation  
New Vapour Retarder  
New 15.8 mm Fire Rated Type X Gypsum Board  
Existing Steel Deck
    - .2 **New Roofing System "R2": Roof Section B**  
New Two (2) Ply Modified Bituminous Roofing Membrane  
New 12.7 mm High Density Fibreboard  
New 84 mm Polyisocyanurate Insulation  
New Vapour Retarder  
Existing Concrete Deck
  - .2 Provide all materials and labour necessary to install two base coats of Rust-Oleum Mathys Noxyde™ / Acrylic Enamel in strict accordance with project drawings, specifications and current Rust-Oleum Corporation application instructions. Provide all material and labour necessary to install one finish coat of ICI Weatherguard on all slope metal roof section C.
  - .3 Modifications to all existing roofing details and parapets as per specifications and drawings.



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- .4 Modifications to all mechanical rooftop unit curbs as required for the proper installation of new flashing membrane, metal flashing and trims. Allow for disconnection, lifting, lowering and reconnection of **all mechanical rooftop units** (including all gas lines, electrical connections/lines and mechanical supply and return lines). Allow for raising **all mechanical rooftop units** with new pressure treated wood blocking/sleepers to achieve a minimum height of 400 mm measured from the bottom of the rooftop unit to the finished roof surface (modified cap sheet membrane).
- .5 Remove all existing rooftop sleeper supports resting on the existing roof membrane and install new pressure treated wood sleepers on roof deck, complete with two ply modified flashing and metal flashing.
- .6 Replace all existing roof drains with new at locations shown on the roof plan drawing.
- .7 Allow for retaining owner approved sub-contractor for the relocation, disconnection and reconnection of all wireless antennas and all associated electrical conduits on walls and on roof surfaces as required.
- .8 An underground garage is located around the building. The underground garage extends outside the limits of the building exterior walls. Contractor is responsible to verify the location of underground garage (suspended slab) prior to placement of any garbage bins, heavy equipment and heavy machinery in order to avoid placement over the underground garage suspended slab. If the garbage bins heavy equipment and heavy machinery should be placed over the underground garage; contractor shall provide signed and sealed engineered shop drawings and load calculations, to avoid overloading of the slab. Allow for all measures to be taken as a result of engineered shop drawings, such as shoring of the slab as required to carry out the replacement project.
- .9 Allow for coordinating with building personnel in order to relocate and place back all wireless rooftop antennas on all roof levels.
- .10 Install new precast concrete pavers on expanded type IV polystyrene insulation padding for all rooftop walkways, around rooftop units, under all duct work supports as shown on roof plan drawing.
- .11 Remove and discard all redundant rooftop projections as indicated on roof plan drawing. Install new structural decking and new roofing system as required at all openings.
- .2 Mechanical and Electrical Work:
  - .1 This article provides an overview of the project and is not complete. Contract Documents in their entirety fully describe the scope of Work.
  - .2 Furnish and install all products, as can reasonably be inferred from Contract Documents, to provide fully functional systems that are complete and ready for the intended use.

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- .3 Work includes:
  - .1 Replace existing six (6) rooftop ventilation units, each with heating and cooling, roof curbs, ductwork, electrical, controls, and other services.
  - .2 Replace and expand existing building automation system.
  - .3 Demolish existing services as required.
  - .4 Modify existing services as required.
- .4 Obtain and pay for permits, certificates, licenses, testing, and inspection fees required to complete Work.

**1.3 GENERAL**

- .1 A Stipulated Price tender is required for the full work specified here and shown on the drawing(s).
- .2 The Contractor shall carryout the project in strict accordance with the requirements of the Ontario Regulation 403/97, Ontario Building Code and all its amendments.
- .3 The Contractor shall secure and pay for all permits, fees, inspections required by all authorities having jurisdiction.
- .4 The Contractor shall register this project with The Ministry of Labour, complete Registration of Constructors and Employers Engaged in Construction form and post/display at the project.
- .5 The Contractor shall comply with all provincial, municipal and local by-laws, ordinances, and safety requirements of all authorities having jurisdiction.
- .6 The building's residence and staff will be occupying the building and the facility is fully operational for the entire duration of this project. No interruptions are allowed to the daily operations of the building for the entire duration of this project. All work shall be carried out with safety of residence and staff in mind, and at no time shall their safety be adversely affected.

**1.4 MULTIPLE CONTRACT SUMMARY**

- .1 All products indicated shall be considered to be part of Work unless otherwise denoted by NIC (Not in Contract) or OFCI (Owner Furnished Contractor Installed).
- .2 Regularly meet with other contractors, and coordinate activities with other contractors as required.
- .3 Include provisions necessary to make concurrent NIC and OFCI work under separate contracts with Owner complete and fully functional in every respect, including field finishing, configuration, and commissioning.
- .4 Coordinate and cooperate with other contractors responsible for project health and safety in compliance with the Occupational Health and Safety Act.

**1.5 SUBMITTALS**

- .1 Submittals For Action
  - .1 Submit as indicated to Engineer for review. Reviews shall be for the limited purpose of reviewing general conformance with the design concept expressed in Contract Documents.

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- .2 In the event Work has been installed without Engineer's written approval, Contractor shall, upon request by Engineer, remove Work with no changes to Contract Price or Contract Time.
  - .1 It is Contractor's sole responsibility to ensure that submittals are timely, complete and comprehensive. Engineer shall review information provided whether or not such information is complete or comprehensive.
  - .2 Engineer may comment on incomplete or missing submittals. Contractor acknowledges that such comments in no way reduce Contractor's responsibility for submittals.
- .2 Submittals For Information
  - .1 Submit as indicated to Engineer on behalf of Commissioning Authority and/or Owner. No review action will be taken by Engineer.
- .3 Submittals For Closeout
  - .1 Submit as indicated to Engineer on behalf of Commissioning Authority and/or Owner. No review action will be taken by Engineer.
- .4 Other Submittals
  - .1 Submit other submittals as indicated to Engineer.
- .5 Submission
  - .1 Transmit each submittal with a letter of transmittal as acceptable to Engineer.
  - .2 Schedule submittals to expedite Work and coordinate submission of related items.
- .6 Preparation: Sequentially number each submittal on Transmittal Form. Revised submittals shall be denoted with the original number and a sequential alphabetic suffix (e.g., 9A, 9B, etc.). Identify:
  - .1 Project name.
  - .2 Contractor, subcontractor and supplier, as applicable.
  - .3 Pertinent Drawing and detail number, and Specification Section and Title, as appropriate, on each copy.
  - .4 Variations from Contract Documents that may be detrimental to successful performance of the completed Work.
  - .5 Product or system limitations that may be detrimental to successful performance of the completed Work.
  - .6 Custom fabrications or assemblies that may require professional engineering services.
  - .7 Changes made since previous submission.
  - .8 Apply Contractor's stamp, signed or initialled, certifying that review, approval, verification of products required, field dimensions, adjacent construction Work, and coordination of information are in accordance with the requirements of Work and Contract Documents.
- .7 Format: Transmit submittals in electronic format unless otherwise indicated.
- .8 Quantity: Submit four (4) copies of submittals in paper format when paper format is indicated.

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- .9 Distribution: Engineer will transmit reviewed submittals with further action as required to Contractor and others at Engineer's discretion. Submittals with completed review actions shall be distributed by Contractor as appropriate.
- .10 Modifications: Engineer may at Engineer's discretion choose to:
  - .1 Review an incomplete submittal.
  - .2 Designate a transmittal as a request for substitution or change proposal.
  - .3 Designate a transmittal as a request for clarification.
  - .4 Review submittals for information or submittals for closeout.
- .11 Submit to Engineer submittals listed below for review. Be prepared to submit with reasonable promptness and in an orderly sequence so as not to cause any delay in the Work the following:
  - .1 Written work schedule (for approval).
  - .2 A detailed breakdown of schedule of pricing.
  - .3 Notification of Designated Substances on Project, Schedule 2.A
  - .4 Site Specific Health and Safety Plan.
  - .5 Proposed method of access to site including storage of materials and location of garbage bin.
  - .6 Samples of any or all specified materials if requested by Engineer, prior to start of the Work.
  - .7 Shop drawings and product data, as specified.
  - .8 Inspection & Testing reports, as specified.
  - .9 Statutory Declaration and Certificate of Clearance, as specified.
  - .10 Material Safety Data Sheets, as specified.
- .12 Colour samples as specified.

## **1.6 EXAMINATION OF SITE AND DOCUMENTS**

- .1 The Contractor shall make a careful examination of the site with respect to all matters relating to the work including but not limited to the means of access and egress, any obstacles and the rights and interests of others which may be interfered with during the course of the work.
- .2 The Contractor shall make a careful examination of the full extent of the work to be performed including all requirements referred to in the Specification, the Drawings and Contract Documents, which are necessary for the full and complete construction of the work and the conditions under which it will be performed. No allowance will be made subsequently for any conditions, which are commonly known or apparent by examination.
- .3 Plans of existing conditions are available for review upon request; and are provided for guidance only and must be verified by the Contractor and Subcontractors.
- .4 Drawings are, in part, diagrammatic and are intended to convey the scope of work and indicate general and approximate locations and arrangement of work. Obtain more accurate information about locations, arrangement and sizes from study and co-ordination of drawings and site conditions.

## **1.7 LAYOUT**

- .1 Verify existing conditions on the site and dimensions shown on the drawings and report any errors or inconsistencies to Engineer before commencing work. Note all irregularities affecting the work of any Section of the Specification.

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- .2 Lay out work in accordance with lines and levels, as shown on drawings. When dimensions and levels are not shown on the drawings, determine site dimensions and levels so that all new work is installed to precisely correct sizes.

#### **1.8 ADDITIONAL TECHNICAL INFORMATION**

- .1 Contractor acknowledges that it has reviewed or has had the opportunity to review, Additional Technical Information not included in Contract Documents including the following:
  - .1 Building drawings.
  - .2 Supplemental project and renovation drawings.
  - .3 Operating and maintenance manuals.
  - .4 Other reports and plans.
- .2 The following information will be available for review at Engineer's business address upon notice of request:
  - .1 Reference standards.

#### **1.9 CONTRACTOR RESPONSIBILITY**

- .1 Contractor acknowledges that the intent of Drawings and Specifications are to describe the scope and quality of Work in a finished state. Contractor is solely responsible for all means, methods, sequences, techniques, and procedures of construction to complete Work as so described.
- .2 Contractor's failure to adhere to submittal and change procedures in no way relieves Contractor of their responsibility for Work.
- .3 Where the drawings or specifications call for the work to be performed by a specific Contractor or Subcontractor, it implies only that the work is of such nature or trade. The Contractor is fully responsible for all of the work performed under the Contract, including determining which trade or section performs the work.
- .4 It is the Contractor's responsibility to ensure the work of all Subcontractors is in full conformity with the Contract documents.

#### **1.10 DRAWINGS AND SPECIFICATION INCONSISTENCIES**

- .1 In case of inconsistency between or within Drawings and Specifications, provide the following unless interpreted otherwise by Engineer:
  - .1 For differences in indicated quality, adhere to better quality of Work.
  - .2 For differences in indicated quantity, adhere to greater quantity of Work.

#### **1.11 CONVENIENCE WARNINGS**

- .1 Drawings or specifications may contain cautionary notes or warnings that draw Contractor's attention to matters regarding means, methods, sequences, techniques, and procedures of construction. Contractor acknowledges that such warnings may not be accurate, complete, or comprehensive, and that such warnings in no way reduce Contractor's sole responsibility for means, methods, sequences, techniques, and procedures of construction.

#### **1.12 JOB CONDITIONS**

- .1 Report in writing to Engineer, prior to commencing work, any conditions or defects encountered on the site upon which the work depends, and which may adversely affect the performance of the work.
- .2 Do not commence work until such conditions or defects have been investigated and corrected.

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- .3 Commencement of work implies acceptance of surfaces and conditions. No claim for damages or resulting extra work will be accepted except where such conditions cannot be determined prior to construction.
- .4 Be responsible for making good, repair and restoration of existing conditions on public or private properties at no cost to the Owner. In all cases blend with existing conditions.
- .5 Any item not specifically mentioned in the description of the Work or shown on the drawings but implied or required to complete with work, will be considered to be included in the total price.
- .6 Contractor shall submit for approval a proposed method of access to site, storage of materials, and location of garbage bin before starting work. All making good and repairs required due to the work shall be the responsibility of the Contractor. This includes planting, fencing, walks, paving, etc.

**1.13 UNKNOWN SITE CONDITIONS**

- .1 If all of the following conditions exist, Contractor shall stop Work and give written notice of the conditions before they are disturbed, and in no event later than 5 working days after first observance of the conditions.
  - .1 Nature of condition is hidden or concealed from visual inspection or other inspection responsibilities identified in the Bid Documents.
  - .2 Condition is materially different from those indicated in Contract Documents.
  - .3 Condition is materially different from those indicated in Additional Technical Information.
  - .4 Condition is materially different from those normally encountered.
- .2 Contractor shall not be entitled to any adjustment in Contract Price or Contract Time if any of the above conditions do not exist.

**1.14 USE OF SITE AND PREMISES**

- .1 Schedule Restrictions
  - .1 Schedule daily and weekly construction activities as required by Owner.
  - .2 Schedule Work outside of occupied hours for:
    - .1 Work in occupiable areas.
    - .2 Work requiring disruption of services to occupiable areas.
    - .3 Work that may disrupt or disturb occupants.
- .2 Request clarification of all matters regarding the use of Site and Premises that may impact construction activities, including:
  - .1 Allowable construction hours.
  - .2 Notices and scheduling of work.
  - .3 Notices and scheduling of disruption of services.
  - .4 Facilities and utilities use.
  - .5 Parking.
  - .6 Security arrangements.
  - .7 Identification requirements.
  - .8 Access requirements including availability and requirements of use for elevators, loading areas and pathways.
  - .9 Disruption mitigation requirements including noise, vibration, dust and smoke.
  - .10 Hazardous materials.
  - .11 Materials storage.
  - .12 Garbage and debris disposal.

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- .3 Emergency Egress: Maintain pathways, exit ways, exit doors, drives, gates and other means of egress during construction, as required by authorities having jurisdiction.

#### **1.15 REGULATORY REQUIREMENTS**

- .1 Applicable Laws, Regulations, Orders, Ordinances, Codes, Standards, and Practices: Performance of Work shall meet or exceed the following requirements:
  - .1 Applicable laws, regulations, orders, ordinances and practices of federal, provincial and municipal governmental agencies and local authorities having jurisdiction over Work.
  - .2 Codes, standards, practices, rules and regulations of public utilities, utility districts and other agencies serving the facility.
  - .3 Owner published policies, standards and practices.
- .2 Edition Dates: The edition of applicable codes, standards, and practices shall be that adopted at the time of issuance of permits by local authorities having jurisdiction, and shall include modifications, additions and interpretations adopted by that jurisdiction. The date of applicable laws, regulations, orders and ordinances shall be that of the date of performance of Work.
- .3 Precedence
  - .1 Where specified requirements differ from the requirements of applicable laws, regulations, orders, and ordinances, the more stringent requirements shall take precedence.
  - .2 Where the Drawings or Specifications require or describe products or execution of better quality, higher standard or greater size than required by applicable laws, regulations, orders, and ordinances, Drawings and Specifications shall take precedence so long as such increase is legal.
  - .3 Where no requirements are identified in the Drawings or Specifications, comply with requirements of applicable laws, regulations, orders, and ordinances, as well as codes, standards and practices of local authorities having jurisdiction.

#### **1.16 USE OF REFERENCES**

- .1 References: Drawings and Specifications contain references to various codes, standards, practices and requirements for products, execution, tests and inspections.
- .2 Relationship to Drawings and Specifications: Codes, standards, and practices referenced in Drawings and Specifications are made a part of Drawings and Specifications to the extent applicable, and shall have the full force and effect as though printed in their entirety in Specifications.
- .3 Completeness: References include addenda, errata, interpretations, supplements, handbooks and guidelines as issued by:
  - .1 Reference standard issuing body(s).
  - .2 Jurisdiction(s) having authority.
- .4 Copies: References are not furnished with Drawings and Specifications as it is presumed that Contractor, subcontractors, manufacturers, suppliers, trades and crafts are familiar with these generally recognized standards of the construction industry.

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- .5 Names: In the event a reference is no longer available or recognized, reference shall be understood to be either:
  - .1 Latest edition of the replacement reference from same publishing organization.
  - .2 Latest edition of the replacement reference from replacement publishing organization.
- .6 Edition Dates
  - .1 Where an edition or effective date of a reference is given, it shall be understood to be the more stringent of:
    - .1 As indicated.
    - .2 Latest edition adopted by authorities having jurisdiction.
  - .2 Where an edition or effective date of a reference is not given, it shall be understood to be the more stringent of:
    - .1 Latest edition adopted by authorities having jurisdiction.
    - .2 Latest edition published at the time of issuance of permits by authorities having jurisdiction.
    - .3 Latest edition published at the time of execution of Contract Documents, whether or not reference has been adopted by authorities having jurisdiction.
- .7 Referenced Grades Classes and Types: Where an alternative or optional grade, class or type of product or execution is included in a reference but is not identified on the Drawings or in the Specifications, provide the highest, best and greatest of the alternatives or options for the intended use and prevailing conditions.
- .8 Conflicting Requirements: Where compliance with two (2) or more references are specified, and these references establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Engineer for a decision before proceeding.

**1.17 SAFETY**

- .1 Comply with provisions of The Occupational Health and Safety Act (latest edition): Regulations for Construction Projects; Construction Safety Act; regulations of the Ontario Ministry of Labour; Workplace Hazardous Materials Information System (WHMIS) Regulation; and the Canadian Construction Safety Code (latest edition), and all amendments. Follow the recommendations of The Construction Health and Safety Manual issued by the Construction Safety Association of Ontario.
- .2 The Contractor shall work in conjunction with the proper safety associations operating under the authority of the Ontario Worker's Compensation Act. The Contractor shall not, in any manner, endanger the safety or unlawfully interfere with the convenience of the public.
- .3 Before commencement of Work, and throughout Contract, maintain on Site readily accessible to those who may be exposed to hazardous materials, a list of all hazardous materials proposed for use on Site, or Workplace, together with current Material Safety Data Sheets (MSDS). Additionally, maintain on site all related required documents as required by all provincial, municipal and local authorities having jurisdiction.
- .4 Provide Engineer with a copy of the list of hazardous materials and MSDS as required.



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- .5 Safety precautions are part of the construction techniques and processes for which the Contractor is solely responsible.
- .6 Erect and maintain fencing and barricades in accordance with governing regulations and as required, ensuring public safety.
- .7 Maintain all public, fire and maintenance access to and from the building and parking garage.
- .8 Construct and maintain hoardings, covered ways and protective canopies as required, to maintain access to the building and provide public safety.
- .9 Engage and pay for the services of a Professional Engineer registered in the Province of Ontario to design and supervise construction and maintenance of hoardings, covered ways, tie back lines and protective canopies.
- .10 The Contractor shall provide and pay for the design and preparation of all required shop drawings pertaining to the hoardings, covered ways, tie backs and protective canopies.
- .11 Smoking on site is not permitted.
- .12 Provide a minimum of three (3) safety helmets for authorized visitors to the workplace.
- .13 Protect public, staff and those on the Work from injury. Equipment when not in use shall have keys removed and locked up in secure location.
- .14 Before commencement of work and upon Owner's and/or Engineer's request, provide Life Safety Check list (Schedule 8), The Contract Notification (Schedule 6), site specific safety plan including fire safety plan, indicating location of hoarding, fencing, disposal bin, material storage etc.... for review and approval.

#### **1.18 SUBSTITUTION PROCEDURES**

- .1 Request for Substitution (RFS): A written request submitted by Contractor to deviate from specified requirements for products, materials, equipment and construction to complete Work, or to provide Work other than as indicated or specified in Contract Documents.
- .2 RFSs will only be considered when submitted in sufficient time to permit proper evaluation by the Engineer.
- .3 Substitutions will not be approved if they are indicated or implied on shop drawings, product data or sample submittals. RFSs shall be by separate written request from Contractor.
- .4 RFS shall include a list of properties for both the specified product and the proposed substitute, including the following information:
  - .1 Clear title denoting the document as a "Request for Substitution".
  - .2 Product identification, including manufacturer's name, address, telephone and fax numbers, and web site address where available.
  - .3 Manufacturer's product data sheets, including material descriptions, compliance with applicable reference standards, and performance and test data.
  - .4 A summarized comparison of physical properties and performance characteristics for the specified product and the proposed substitution, and clearly highlighting significant variations.
  - .5 Indication of availability of maintenance services and sources of replacement materials and parts, including associated costs and time frames.
  - .6 Indication of cost savings and reduction of construction schedule.
  - .7 Verification that the substitute will not result in additional costs or a reduction in performance to other portions of the Work.

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- .8 Reason for requesting substitution.
- .5 Provide additional information requested by Engineer to demonstrate that the proposed substitute will perform equally as well or better as the specified product.
- .6 Clauses such as "or equal", "or approved equal", or other similar clauses, will not be construed as an invitation to submit RFSs or to unilaterally substitute products in place of the specified products and systems.
- .7 Failure to order specified products in adequate time to meet the approved construction schedule will not be a valid reason to submit a request for substitution. Delays remain the responsibility of Contractor, and will not result in an extension to Contract Time or be subject to reimbursement by Owner.
- .8 The Owner is under no obligation to consider product or system substitutions recommended by Contractor.
- .9 In the event a substitution has been incorporated into Work without Engineer's written approval:
  - .1 Contractor shall remove the substitution and replace it with the specified product with no change in Contract Price or Contract Time.
  - .2 Alternatively, Contract Price shall be reduced by the sum of:
    - .1 The amount that the installed price of the specified product exceeds that of the substituted product, as determined by Engineer.
    - .2 Engineer fees required to evaluate and administer the impact of the substitution.
    - .3 The net present value of lifecycle costs resulting from the substitution, as determined by Engineer, including energy efficiency, maintenance costs, permit fees, and changes in related Work resulting from substitution.
- .10 Substitutions shall not result in any delay in completion of Work, including work under separate contracts by Owner.
- .11 Substitutions shall not result in any increase in Contract Price and Contract Time.
- .12 Should additional costs be incurred, directly or indirectly as the result of substitution, including costs for re-design, engineering reviews, and work under separate contracts by Owner, such costs shall be paid by Contractor. Such fees shall be deducted from Contract Price by Owner. Owner will then pay Engineer.
- .13 Should changes be required due to substitutions, such changes shall be made by Contractor, subject to review by Engineer, at no increase in Contract Price and Contract Time.

**1.19 CLARIFICATION PROCEDURES**

- .1 Request for Clarification (RFC): A document submitted by Contractor requesting clarification of a portion of Contract Documents, hereinafter referred to as an RFC.

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- .2 Submit a written RFC when any of the following occur:
  - .1 Exact material, process, or system to be installed is unclear.
  - .2 Elements of construction are required to occupy the same space (interference).
  - .3 An item of Work is described differently at more than one place in Contract Documents.
- .3 RFCs shall not be used for the following purposes:
  - .1 To request approval of submittals or substitutions.
  - .2 To request changes that only involve change in Contract Price and Contract Time.
  - .3 To request different methods of performing Work than those indicated in Drawings and Specifications.
- .4 Requested Information: RFCs that request interpretation of requirements clearly indicated in Contract Documents will be returned without interpretation.
  - .1 In cases in which RFCs are issued to request clarification of issues related to means, methods, sequences, techniques, and procedures of construction, for example, pipe and duct routing, clearances, specific locations of Work shown diagrammatically, apparent interferences and similar items, Contractor shall furnish information required for Engineer to analyze and/or understand the circumstances causing the RFC and prepare a clarification or direction as to how Contractor shall proceed.
  - .2 If information included with this type of RFC by Contractor is insufficient, the RFC will be returned unanswered.
- .5 Disputed Requirements: In the event that Contractor believes that a clarification by Engineer results in changes to Contract Price or Contract Time, Contractor shall not proceed with Work indicated by the RFC until authorized to proceed by Owner and Engineer and claims, if any, are resolved in accordance with Contract provisions.

#### **1.20 CONTRACT MODIFICATION PROCEDURES**

- .1 Instruction Supplement: Engineer will issue an Instruction Supplement (Supplemental Instruction) authorizing changes in Work not involving adjustment to Contract Price or Contract Time.
- .2 Change Proposal: If conditions require modifications to Contract Documents, or upon written request from Engineer, Contractor may propose changes by submitting a Change Proposal. Include the following:
  - .1 Complete description of proposed change.
  - .2 Reason for change.
  - .3 Details explaining impact on Contract Price.
  - .4 Details explaining impact on construction schedule, and Contract Time.
  - .5 Indicate taxes, delivery charges, equipment rental, and amounts of trade discounts.
- .3 Change Order: On Owner's approval of a Change Proposal, Engineer will issue a Change Order for signature by Owner and Contractor.

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**1.21 PROJECT ADMINISTRATION**

- .1 Submittals and Transmittals
  - .1 Format: Provide submittals and transmittals in electronic format unless otherwise indicated.
    - .1 Electronic Format
      - .1 Transmit to recipients' email addresses.
      - .2 Transmit in Adobe PDF format acceptable to Engineer, including clarity and alignment.
    - .2 Paper Format
      - .1 Transmit to recipients at recipients' business addresses.
      - .2 Transmit in paper format acceptable to Engineer, including size, colour, clarity and alignment.
  - .2 Recipients: As required.
  - .3 Response: Allow ten (10) working days for responses from Engineer unless otherwise indicated.
- .2 Project Meetings: Schedule and conduct meetings and conferences at site as required.
  - .1 Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Engineer of scheduled meeting dates and times.
  - .2 Agenda: Prepare the meeting agenda. Distribute the meeting agenda not less than two (2) working days before the meeting to invited attendees.
  - .3 Minutes: Prepare the meeting minutes. Distribute the meeting minutes within two (2) working days of the meeting to invited attendees. Include the following information:
    - .1 Record significant discussions.
    - .2 Agreements achieved.
    - .3 A list of action items, including responsibility, and expected completion dates.
  - .4 Modifications: Owner may modify project meeting requirements, including Engineer to take responsibility for project meeting minutes, at no change to Contract Price or Contract Time.
- .3 Progress Meetings: Conduct progress meetings at weekly intervals. Coordinate dates of meetings with preparation of payment requests.
  - .1 Attendees: Participants at the conference shall be familiar with Work and authorized to conclude matters relating to Work.
  - .2 Agenda
    - .1 Review and correct or approve minutes of previous progress meeting.
    - .2 Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Work.
    - .3 Review progress since last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule in relation to Contractor's construction schedule.
    - .4 Determine how construction schedule will be expedited.
    - .5 Secure commitments from parties involved to do so.

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- .6 Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within Contract Time.
- .3 Schedule
  - .1 Updates: Update construction schedule after each progress meeting where revisions to the schedule have been made or recognized.
  - .2 Distribution
    - .1 Submit updated construction schedule in ledger sized paper format concurrently with the report of each progress meeting.
    - .2 Transmit updated construction schedule in electronic format to Engineer.
  - .3 Revisions: Review and evaluate construction schedule regularly during construction. Revise construction schedule as necessary as a result of review, and resubmit within two (2) working days.
  - .4 Format: Computer formatted Gantt chart.
- .4 Reporting: Provide brief narrative progress report to define problem areas, anticipated delays, and impact on the construction schedule. Report corrective actions taken or proposed, and its effect including the effects of changes on schedules of separate contracts. Identify modifications since previous submittal, including activities and changes.
- .5 Distribution
  - .1 Distribute reports and schedules within two (2) working days of the meeting.
  - .2 Distribute to Contractor's site file, to subcontractors, suppliers, Engineer, Owner, and other concerned parties.
  - .3 Instruct recipients to promptly report, in writing, problems anticipated by projections shown in schedules.

**1.22 OVERTIME**

- .1 The Contractor and Subcontractors shall include for any and all overtime rates that may be incurred in execution of the work included in the tender. All work must be done to the entire satisfaction of the Owner and Engineer.
- .2 When progress of the Work falls behind the schedule submitted by the Contractor, and upon instructions for the Engineer, the Contractor shall increase the forces on the site as well as hours worked each day in order to catch up to the schedule. This work shall be done without extra cost to the Owner.

**1.23 QUALIFICATION OF WORKERS**

- .1 Provide at least one person with each trade, to be present at all times during execution of the work of that trade, and thoroughly trained and experienced in performing the work, and to direct all work performed under that Section. Continuously inspect all work to ensure it is properly executed.
- .2 For operating equipment use only thoroughly trained and experienced operators.
- .3 For installation of various items of work, or for finishing work of any trade, use only personnel thoroughly trained and experienced operators.

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- .4 In the acceptance or rejection of finished work, no allowance will be made for lack of skill on the part of people employed.
- .5 Submit proof of qualifications as required and specified within relevant sections for each trade.

#### **1.24 TEMPORARY SERVICES & FACILITIES**

- .1 Temporary Utilities
  - .1 Provide temporary electrical power, lighting, water, heating and cooling, and ventilation as necessary for proper performance of Work.
  - .2 Do not disrupt services or occupants except at dates and times approved by Owner.
  - .3 Maximum allowable downtime for rooftop HVAC units being replaced:
    - .1 AC1 and AC2: 14 days
    - .2 All other units: 5 days
  - .4 Coordinate with Owner for points of connection, protection and payment of service charges.
  - .5 Exercise measures to conserve energy.
  - .6 Provide temporary emergency backup power in the event of interruption of existing backup emergency power.
- .2 Temporary HVAC: Provide temporary heating, cooling, and ventilation as required to maintain occupant comfort and prevent interference or disruption of occupant operations.
- .3 Temporary Barriers: Provide temporary fencing, barriers and guardrails as necessary to provide for public safety, to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations.
- .4 Temporary Closures: Provide temporary closures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations and similar activities. Provide temporary weather-tight enclosure for building exterior.
- .5 HVAC Protection: Provide dust barriers at HVAC return grilles and air inlets to prevent spread of dust and clogging of filters.
- .6 Protection of Installed Work: Provide temporary protection for installed products. Control traffic in immediate area to minimize damage.
- .7 Temporary Floor Protection
  - .1 Protect existing floors from soiling and damage.
  - .2 Cover floors with 2 layers of 0.08 mm (3 mil) polyethylene sheets, extending sheets 460-mm (18 in) up the side walls.
  - .3 Cover polyethylene sheets with 25 mm (1 inch) fire-retardant plywood.
  - .4 Provide mats to clean dust from shoes.
- .8 Protective Coverings: Provide protective coverings at walls, projections, jambs, sills and soffits of openings as necessary to prevent damage from construction activities, such as coatings applications, and as necessary to prevent other than normal atmospheric soiling.

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- .9 Removal of Temporary Facilities and Controls
  - .1 Remove temporary utilities, equipment, facilities, and materials prior to Substantial Completion Review.
  - .2 Remove underground installations to a minimum depth of 610 mm (2 ft). Grade site as indicated.
  - .3 Clean and repair damage caused by installation or use of temporary facilities and controls.
  - .4 Restore existing and permanent facilities used during construction to original condition. Restore permanent facilities used during construction to condition equal to or better than at commencement of construction.

**1.25 QUALITY CONTROL**

- .1 Quality Assurance: Ensure products, services, workmanship and site conditions comply with requirements by coordinating, supervising, testing and inspecting Work, and by utilizing only suitably qualified personnel.
- .2 Minimum Quality: Where no quality basis is prescribed, the quality shall be in accordance with the higher of:
  - .1 Best accepted practices of the construction industry for projects of this type, and in this location.
  - .2 Quality of the latest changes and renovations to the existing building installation, as it exists now.
  - .3 Quality of the existing base building installation, as it existed when newly installed.
- .3 Quality of Products: Unless otherwise indicated or specified, products shall be new, free of defects and fit for the intended use.
- .4 Quality of Installation: Work shall be produced plumb, level, square and true, or true to indicated angle, and with proper alignment and relationship between the various elements. Ensure Work is properly related to form close joints and appropriately aligned junctions, edges and surfaces and is free of warp, twist, wind, wave or other irregularities.
- .5 Protection of Existing and Completed Work: Take measures necessary to preserve and protect existing and completed Work free from damage, deterioration, soiling and staining, until Acceptance by Owner.
- .6 Manufacturer's Instructions and Recommendations: Comply with manufacturer's instructions in preparing, fabricating, erecting, installing, applying, connecting and finishing Work, unless more stringent requirements are required, indicated or specified.
- .7 Deviations: Document and explain deviations from requirements, including references, reference standards, building code research report requirements, and manufacturer's product installation instructions and recommendations. Include acknowledgment by manufacturer that such deviations are acceptable and appropriate for Work.
- .8 Verification of Quality: Work shall be subject to verification of quality by Owner or Engineer in accordance with provisions of the conditions of Contract Documents.
- .9 Defects and Blemishes: Correct defects, blemishes and other aesthetic issues identified by Engineer.

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- .10 Inspections and Tests: Arrange required inspections and tests including those required by:
  - .1 Authorities Having Jurisdiction
  - .2 Serving Utilities
  - .3 Conditions of Warranty
  - .4 Products, Materials or Equipment Manufacturer
  - .5 Certification of Work
  - .6 Contract Documents
- .11 Contractor shall photo document construction progress with time stamped digital photographs.
- .12 Contractor shall maintain daily sign in and sign out logs of the construction site.
- .13 Owner may monitor the construction site with video surveillance to document construction progress and to provide evidence for valuing Change Directives.

**1.26 COORDINATION WITH OTHER WORK**

- .1 Coordinate and cooperate with all other trades working in the area so that no delay or unnecessary rework is required. Any such rework, delay or cause for delay shall be deemed the result of Contractor's coordination or lack thereof and shall be at the sole expense of the Contractor.
- .2 Ensure that all Subcontractors examine the Drawings and Specification covering the work of all other Subcontractors which may affect the performance of their own work.
- .3 It is the Contractor's responsibility to ensure that all work is carried out in compliance with the Contract Documents and to accept responsibility for delays or costs arising from his failure to inspect a Subcontractor's work.
- .4 Ensure that all Subcontractors and other trades cooperate with other Subcontractors whose work attach to, or are affected by their own work, and ensure that all required adjustments are made to allow proper attachment of adjoining work.
- .5 Ensure that Subcontractors requiring anchorages or openings to be left for the installation of their work furnish the necessary information to the parties concerned in ample time so that proper provision can be made to install such anchorages or openings.
- .6 Take field dimensions relative to the work. Fabricate and erect work to suit field dimensions and field conditions.
- .7 Provide all forms, templates, anchors, sleeves, inserts and accessories required to be fixed to or inserted into the work and set in place or instruct the related trades as to their location.
- .8 Provide free access to Engineer and other authorized personnel to all areas of the Work. Allow for slight delays to the progress of the work to facilitate Engineer's or Owner's inspection and testing.
- .9 Coordinate access and allow sufficient time to Owner's separate contractors during the course of the work.

**1.27 MATERIAL STORAGE & HANDLING**

- .1 Store packaged materials in original, undamaged condition with Manufacturer's labels and seals intact. Handle and store materials in accordance with Manufacturer's and Supplier's recommendations, prevent damage to materials during storage and handling, and replace any damaged materials.
- .2 Obtain Owner's approval of the location and extent of all on-site storage areas.



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- .3 Be responsible for the security of all materials and equipment.

#### **1.28 PERMITS, INSPECTION & APPROVAL CERTIFICATES**

- .1 The Contractor shall apply and pay for the Building Permit (if required).
- .2 The Contractor shall be responsible for, and shall pay all costs, for all other permits, tests, inspections and certificates, as required by the local municipality and all regional, provincial, and federal authorities having jurisdiction.
- .3 The Contractor shall comply with all by-laws, ordinances, and safety requirements of all authorities having jurisdiction.
- .4 Copies of inspection/approval certificates must accompany any invoices.

#### **1.29 STANDARDS & CODES**

- .1 All Standards, Codes, Regulations, Contract Forms, Manuals, Installation, Application and Maintenance Instructions, referred to in this specification, unless otherwise specified, shall be understood to be the latest published edition including all amendments.
- .2 The laws of the place of the work shall govern the work.

#### **1.30 CERTIFICATION OF MATERIALS**

- .1 Prior to the commencement of any work, obtain written certification from the manufacturer(s) of the suitability of the materials selected to the applications required, and that all materials used are compatible with each other and with existing materials.
- .2 If the material designated for a given application is not certifiable, provide alternate, certifiable materials for the application and submit the change to the Engineer for review.

#### **1.31 PROTECTION**

- .1 The building will remain occupied during the work; therefore it is essential that access to the existing building be maintained at all times.
- .2 Supply and install a construction barrier around the work areas and directly below all work areas, including overhead protection hoarding. The Owner/Engineer shall approve the construction barrier around the work areas, and hoardings.
- .3 Maintain all emergency and service access routes clear at all times. Provide all barricades and signs necessary to direct vehicular and pedestrian traffic around construction areas.
- .4 Protect all trees and planting areas that are to remain, in accordance with the General Conditions. Make good all damage at no extra cost.
- .5 Protect, relocate and maintain existing, active services wherever they are encountered.
- .6 Erect suitable safety barriers as required for security and to make the site safe for pedestrians.
- .7 Construct and maintain hoardings, covered ways and protective canopies as required to maintain access to the building and public safety. Erect hoarding around all work and storage areas.
- .8 Construct hoarding to minimum height of 2400 mm using, but not limited to, plywood sheets, suitable columns, and wood framing.
- .9 Take precautions to protect openings made in existing building from entry of elements and of persons during construction and to protect existing structure and finishes from damage.

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- .10 Provide suitable protection to prevent rain, ground water, frost, and snow or wind damage to exposed sections of the building.
- .11 Adequately protect the work at all stages, and maintain the protection until the work is completed. Remove and replace any work and materials damaged that cannot be satisfactorily repaired at no extra cost.
- .12 Damaged work shall be made well by the original trade, but at the expense of those causing damage.
- .13 Provide and maintain in accordance with applicable provincial and municipal regulations and NBC, all necessary precautions during execution of the work to fully protect occupants, public and Owners from loss, damage, death or injury through neglect, carelessness or incompetence of Contractor, his employees, or Subcontractors including the condition of his equipment.
- .14 Protect roof and terrace surfaces from construction activities and be responsible for the repair of any damage.
- .15 Provide a protective barrier between the work areas and the building interior to maintain non-work areas usable and dust-free. Protective barrier shall be capable of withstanding potential weather damage and/or vandalism, and shall fully protect occupants from the Work.
- .16 Dusty operations shall be contained behind dustproof enclosures. Protect building interior from the intrusion of dust, smoke, odours, chemical contamination or any other debris resulting from the work.
- .17 Protect floor and wall surfaces during the Work from all construction activities by using exterior plywood sheathing panels.
- .18 Do not load any part of the structure during the work with loads greater than it is calculated to bear safely when completed. Make all temporary supports as strong as permanent support.
- .19 Engage and pay for the services of a Professional Engineer registered in the Province of Ontario to design and supervise construction and maintenance of all temporary shoring.
- .20 Verify the location of garbage bin prior to delivery, to avoid placement of bin over any suspended slabs, unsound grounds and hazardous areas on site. If the garbage bin should be placed over suspended slabs, such as underground garages, trenches, etc..., provide signed and sealed engineered shop drawings and load calculations as described in section 01300 of this specification, to avoid overloading of the slab. Allow for all measures to be taken as a result of engineered shop drawings, such as shoring of the slab as required to carry out the replacement project.

### **1.32 PLANT & MACHINERY**

- .1 Provide all form work, motorized lifts, scaffolding, equipment, tools and machinery for the proper execution of the work.
- .2 When machinery weight is excessive, the existing walls and slabs shall be properly shored during repair operations where appropriate.
- .3 Construct and maintain scaffolding in a secure and safe manner. Erect scaffolding independent of walls. Use scaffolding in such a manner as to interfere as little as possible with other trades, traffic, or with normal usage of the building.
- .4 Take all necessary precautions to adequately protect the building, paving and landscape materials, including shrubs and trees, from damage.

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- .5 Make good at no extra cost and to the satisfaction of the Owner any damaged resulting from the provision and/or usage of form work, scaffolding, etc. Maintain all public, fire and maintenance access to and from the building.

### **1.33 SCAFFOLDING**

- .1 Install overhead protection hoarding and scaffolding at the outside of the building access doors, on the ground level as required. Design scaffolding to safely support the loads it will be subjected to during the Work. Erection of scaffolding shall be by the scaffolding supplier.
- .2 All scaffolding shall be designed and approved in the field by a Professional Engineer registered in the Province of Ontario and experienced in scaffolding design.
- .3 The Contractor shall provide and pay for the design and preparation of all temporary scaffolding shop drawings. The shop drawings shall bear the seal of the approved Professional Engineer.
- .4 Scaffolding shall be installed in accordance with the reviewed and approved shop drawings, and shall be reviewed by the Contractor's scaffolding design engineer prior to commencement of any work.
- .5 Comply with the requirements of the Occupational Health and Safety Act and Regulations for Construction Projects, latest edition, and with guidelines/data sheets published by the Construction Safety Association of Ontario.
- .6 The scaffolding supplier and Contractor shall work together to provide proper maintenance and service to the scaffolding, ensuring safety at all times.
- .7 Provide, install and maintain all barricades, warning signs, temporary marking, etc., as may be necessary for protection of the public below and around the construction area.

### **1.34 BUILDING ACCESS**

- .1 Workers are not permitted access to the building interior without prior authorization from the Owner.

### **1.35 GENERAL REVIEWS & INSPECTIONS**

- .1 Give timely notice when any phase of the work is ready for review and notice in writing when the work is complete and ready for final review. The Contractor shall notify the Engineer and inspection and testing agencies not less than forty-eight (48) hours prior to each part of the work being ready for review or testing.
- .2 All materials are subject to inspection by the Engineer on arrival on the site. Any materials not meeting the specifications will be rejected and must be removed from the site immediately.
- .3 Allow in the Contract Amount for the costs associated with providing facilities and access for inspections of the work, excluding the cost of the Engineer's time which will be paid for by the Owner.
- .4 The Engineer shall measure quantities of Unit Price items after preparation is complete but prior to placement of the materials. Provide access for measurements. Do not allow materials to be placed until Engineer has measured quantities.
- .5 Allow for in the Contract Amount, all costs associated with providing facilities and access for inspection of the work required by the manufacturers of the specified materials.
- .6 Terms: The term General Review may be referred to or replaced by the term General Assessment for the whole of or any part of Work as determined by Engineer.

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- .7 Purpose: General Reviews are completed by Engineer as required for the sole purpose of reviewing whether Work is in general conformance with the design concept.
  - .1 No implied approval or acceptance of submittals, substitutions, or changes shall be inferred from General Reviews.
  - .2 No implied approval or acceptance of changes in Contract Price and Contract Time shall be inferred from General Reviews.
  - .3 General Reviews are not to be relied upon for testing, commissioning, and required inspections by authorities having jurisdiction or other quality assurance purposes.
  - .4 General Reviews do not relieve Contractor of responsibility for meeting all requirements of Contract Documents.
- .8 Frequency: Frequency of General Reviews determined by Engineer during Contract Time or after Contract Time.
  - .1 General Reviews will continue to be made until the Final General Review.
- .9 Reports: Engineer submit a report for each General Review.
  - .1 General Review reports may refer to other documents that are considered as part of the General Review report.
  - .2 Notify Engineer in writing within three (3) working days of receiving General Review report should Contractor disagree with items noted in report.
- .10 Punch Lists: Prepare and maintain a typewritten, comprehensive list of items to be completed and corrected to make Work ready for acceptance by Owner.
  - .1 Update punch list with the items described in the General Review report.
  - .2 Immediately correct deficiencies and incomplete items described in General Review reports at no change in Contract Price or Contract Time.
- .11 Additional General Reviews and Meetings: Engineering fees due to additional General Reviews and meetings requested by Contractor, or required by Engineer for reasons including Contractor's failure to meet construction schedule, correct deficiencies, and complete incomplete items, shall be paid by Contractor.
  - .1 Such fees shall be deducted from Contract Price by Owner. Owner will then pay Engineer.
- .12 Final General Review
  - .1 Submit a written request for the Final General Review indicating completion of Work. Include the following in request:
    - .1 Statement that all outstanding General Review items have been rectified.
    - .2 Declaration that Contractor has prepared and completed all Final Completion Submittals as described below.
    - .3 Date and signature.
  - .2 Upon receipt of request, Engineer will proceed with Final General Review.

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- .13 Additional Final General Reviews and Meetings: Engineering fees due to additional Final General Reviews and meetings caused by Contractor's premature requests shall be paid by Contractor.
  - .1 Such fees shall be deducted from Contract Price by Owner. Owner will then pay Engineer.
- .14 Immediately notify the Engineer of any unforeseen conditions encountered during the execution of the work which:
  - .1 Requires correction or repair, in the good judgment of the Contractor, in conjunction with the work of the Contract or in order that the work of the Contract may proceed and for which Changes in the Work are required to be made, or,
  - .2 Represents a quantity of work that is appreciably greater than that foreseen, as generally defined by the Contract.

**1.36 MAINTENANCE**

- .1 Maintain all parts of the work from the time of installation until final acceptance.
- .2 Report immediately, in writing to the Engineer, all incidents of damage to the installation by vandals, prior to acceptance.

**1.37 PRODUCT REQUIREMENTS**

- .1 Product Selection: Provide products that are undamaged, unused, and rated for the conditions to which they will be subjected.
- .2 Standard Products: Where specific products are not specified, provide standard products of types and kinds that are suitable for the intended purposes and that are usually and customarily used on similar projects under similar conditions. Products shall be subject to review and acceptance by Engineer.
- .3 Product Completeness: Provide products complete with accessories, trim, finish, safety guards, structural supports, platforms, braces, tie-rods, and other devices, details and configuration needed for a complete installation and for the intended use and effect.
- .4 Interchangeability: To the fullest extent possible, provide products of the same kind from a single source. Products required to be supplied in quantity shall be the same product and interchangeable throughout Work. When options are specified for the selection of any of two (2) or more products, the product selected shall be compatible with products previously selected.
- .5 Products specified by one or more manufacturers, brand names or model numbers are included to describe operational characteristics, performance attributes, quality, serviceability, and other relevant characteristics.
  - .1 Other products having similar characteristics as determined by Engineer will be accepted under substitution procedures.
- .6 Products Specified by Description: Where Specifications describe a product, listing characteristics required, with or without use of a brand name, provide a product that has the specified attributes and otherwise complies with specified requirements as determined by Engineer.

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- .7 Products Specified by Performance Requirements or Intent: Where Specifications require compliance with performance requirements, intent, or functionality, provide product(s) and/or assemblies that comply and are recommended by the manufacturer for the intended application. Verification of manufacturer's recommendations may be by product literature or by certification of performance from manufacturer.
- .8 Products Specified by Reference to Standards: Where Specifications require compliance with a standard, provided product shall fully comply with the standard specified.
- .9 Products Specified by Combination of Methods: Where products are specified by a combination of attributes, including manufacturer's name, product brand name, product catalogue or identification number, industry reference standard, or description of product characteristics, provide products conforming to specified attributes.
- .10 Visual Matching: Where sample matching is required, the decision by Engineer on whether a proposed product matches shall be final. Where no product visually matches but the product complies with other requirements, comply with provisions for substitutions for selection of a matching product in another category.
- .11 Selection of Products: Where requirements include the phrase "as selected from manufacturer's standard colors, patterns and textures" or a similar phrase, selections of products will be made by indicated party or, if not indicated, by Engineer. Engineer will select color, pattern and texture from the product line of submitted manufacturer if all other specified provisions are met.
- .12 System Completeness
  - .1 Drawings and Specifications are not intended to be comprehensive directions on how to produce Work. Rather, Drawings and Specifications describe the design intent for the completed Work.
  - .2 It is intended that equipment, systems and assemblies be complete and fully functional even though not fully described. Provide products and operations necessary to achieve the design intent described in Contract Documents.
  - .3 Refer to related general requirements regarding compliance with minimum requirements of applicable codes, ordinances and standards.
- .13 Omissions and Mistakes: Contractor shall report to Engineer immediately when elements essential to proper execution of Work are discovered to be missing or mistakes are found in Drawings and Specifications or if the design intent is unclear.
  - .1 Should an essential element be discovered as missing or mistakes are found prior to receipt of Bids, an Addendum will be issued so that costs may be accounted for in Contract Price.
  - .2 Should an obvious omission or obvious mistake describing a necessary element be discovered and reported after execution of the Agreement, Contractor shall provide the element as though fully and correctly described, and a no-cost Change Order shall be executed.
  - .3 Refer to related general requirements regarding construction interfacing and coordination.

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**1.38 SHOP DRAWINGS & SAMPLES**

- .1 The Contractor shall submit one (1) original and three (3) copies of all required shop drawings (Where required) to the Engineer. The Contractor shall check, correct, date, stamp reviewed and sign all shop drawings before submission. The Engineer will review the original copy and return it to the Contractor who will supply up to five (5) prints of the reviewed original for use by others as required. The Engineer's review is for general arrangement only, and review does not relieve the Contractor of responsibility for errors, omissions, or conforming to the Contract documents without prior written permission from the Engineer.
- .2 Copies of all reviewed shop drawings shall be kept on the site in a neat orderly condition. Only copies marked with the Engineer's review stamp shall be permitted on the site.
- .3 Submit for review samples in triplicate as requested in respective specification Sections. Label samples as to origin and intended use in the Work.
- .4 Deliver samples prepaid to Engineer's business address.
- .5 Notify the Engineer in writing, at the time of submission, of any deviations in samples from requirements of Contract Documents.
- .6 Adjustments made on samples by the Engineer are not intended to change the Contract Price. If adjustments affect the value of Work, state such in writing to the Engineer prior to proceeding with the Work.
- .7 Make changes in samples that the Engineer may require, consistent with Contract Documents.

**1.39 EXECUTION REQUIREMENTS**

- .1 Acceptance of Conditions
  - .1 Examine existing conditions, surfaces and substrata upon which Work depends.
  - .2 Drawings are diagrammatic and intended to convey scope of Work and indicate general and approximate location, arrangement and sizes of equipment and services including piping, ductwork, and wiring.
  - .3 Obtain more accurate information about locations, arrangement and sizes from:
    - .1 Study and coordination of existing building drawings, base building drawings, existing equipment and systems shop drawings, and manufacturers' literature.
    - .2 Site inspection and measurement.
- .2 Preparation
  - .1 Determine exact location and routes for Work including equipment and services.
  - .2 Relocation
    - .1 Modify routing and/or relocate equipment and services as required.
    - .2 Relocate existing equipment and services as required, including piping, ductwork, electrical, controls, fire protection including sprinklers and detection.
  - .3 Demolition and Removal
    - .1 Remove obsolete equipment and services to satisfaction of Engineer within affected areas, including existing services not affected by Work,

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- .1 As required.
    - .2 As indicated including markings on site.
  - .2 Relocate existing equipment and services that interfere with Work.
  - .3 Refrain from cutting by dismantling whenever possible. If cutting is required, submit Demolition Plan for approval before cutting.
- .3 Transportation, Delivery and Handling
  - .1 Comply with manufacturer's instructions and recommendations.
  - .2 Provide all equipment and personnel as required.
  - .3 Coordinate with Owner for delivery and acceptance.
  - .4 Delivery: Schedule delivery to minimize long-term storage and prevent overcrowding construction spaces. Coordinate with installation to ensure minimum holding time for items that are flammable, hazardous, easily damaged or sensitive to deterioration, theft and other losses.
- .4 Storage
  - .1 Provide temporary off site storage for products until ready for installation. Temporary on site storage is prohibited unless approved by Owner.
  - .2 Store and protect products in accordance with manufacturer's instructions, with seals and labels intact and legible.
  - .3 Store sensitive products in weather-tight enclosures or covered with an impervious sheet covering. Provide adequate ventilation, temperature and humidity control to avoid condensation, corrosion and damage due to temperature and humidity limits.
  - .4 Periodically inspect to ensure that products are undamaged and are maintained under required conditions.
  - .5 Products damaged by improper storage or protection shall be removed and replaced with new products at no change in Contract Price or Contract Time.
- .5 Installation of Products
  - .1 Comply with manufacturer's instructions and recommendations for installation of products, except where more stringent requirements are specified, are necessary due to Work, or are required by authorities having jurisdiction.
  - .2 Anchor each product securely in place, accurately located and aligned with other Work.
  - .3 Clean exposed surfaces and provide protection to ensure freedom from damage and deterioration.
  - .4 Provide sufficient clearance for servicing and maintenance access.
  - .5 Protect installed products from damage during construction, including surface marring, vibration and dust. Provide protective wrappings as required.
- .6 Intent and/or Functionality
  - .1 Where Contract Documents describe intent and/or functionality, Contractor to:
    - .1 Complete design of system to meet requirements.
    - .2 Submit shop drawings for approval.
    - .3 Revise design as required until approved by Engineer.



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- .4 Furnish and install products including equipment and components.
      - .5 Complete configuration activities.
    - .2 Upon request, demonstrate functionality to the satisfaction of Engineer.
  - .7 Capability
    - .1 Where Contract Documents describe capability, Contractor to:
      - .1 Complete design of system to meet requirements.
      - .2 Submit shop drawings for approval.
      - .3 Revise design as required until approved by Engineer.
      - .4 Furnish and install products including equipment and components, such that upon future configuration, the system will be capable of performing as specified.
  - .8 Cleaning
    - .1 Conduct cleaning operations in compliance as required, including Owner requirements, applicable laws, regulations, orders and ordinances, codes, standards, and practices, including waste management and environmental protection laws.
    - .2 Clean areas, equipment, fixtures, surfaces, and products affected by construction including:
      - .1 Parking areas, sidewalks, driveways and streets.
      - .2 Metal surfaces.
      - .3 Floor surfaces.
      - .4 Horizontal and vertical surfaces.
      - .5 Lighting fixtures.
      - .6 Glass and mirrors.
      - .7 Exterior grounds and gardens.
    - .3 Metalwork: Clean and buff metalwork to be free of soiling and fingerprints. Mirror finished metal work shall be buffed to high lustre.
    - .4 Clean surfaces in existing and adjacent buildings where construction activities have caused soiling and accumulation of dust and debris.
      - .1 Wash down exterior surfaces to remove dust.
      - .2 Clean exterior surfaces of mud and other soiling.
      - .3 Clean exterior side of windows, including window framing.
    - .5 Ventilation System Cleaning: Replace filters and clean heating and ventilating equipment used for temporary heating, cooling and ventilation.
    - .6 Contract Completion Review Cleaning: Execute a thorough cleaning prior to Contract Completion review. Complete final cleaning before submitting final Application for Payment.
    - .7 Failure to Clean: Should cleaning by Contractor not be sufficient or acceptable to Engineer, especially regarding paths of travel, Owner may engage cleaning service to perform cleaning and deduct costs for such cleaning from sums owed to Contractor.
    - .8 Cleaning Frequency: Daily

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- .9 Cleaning Agents and Materials
  - .1 Non hazardous to health or property.
  - .2 Use cleaning materials only on surfaces recommended by cleaning agent manufacturer.
- .10 Use only those cleaning agents, materials and methods recommended by manufacturer of the material to be cleaned.
- .9 Waste Removal
  - .1 Conduct disposal operations in compliance as required, including Owner requirements, applicable laws, regulations, orders and ordinances, codes, standards, and practices, including waste management and environmental protection laws.
  - .2 Provide waste removal facilities and services as required to maintain the site and existing facilities in clean and orderly condition.
  - .3 Provide containers with lids. Dispose of waste off-site periodically.
  - .4 Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.
- .10 Waste Management
  - .1 Separate and dispose of construction waste in compliance as required, including Owner requirements, applicable laws, regulations, orders and ordinances, codes, standards, and practices, including waste management and environmental protection laws.

**1.40 WORK SCHEDULE**

- .1 Submit a written work schedule showing the timing of all phases of the work for approval by the Owner within one week from the Contract award.
- .2 Hours of work on the site shall be first approved by the Owner. Weekend work will not be permitted unless otherwise authorized by Owner.
- .3 Noisy and dust raising operations may only be carried out between 8:00 a.m. and 5:00 p.m., Monday to Friday inclusive, except for statutory holidays, unless otherwise authorized by the owner. All work hours shall comply with the local noise by-laws of authorities having jurisdiction.
- .4 Seventy-two (72) working hours notice will be required for work to be performed outside the designated times detailed herein. Include for all overtime for work carried out outside normal working hours.

**1.41 WARRANTY**

- .1 Warrant all work for the period specified from the date of acceptance. During the warranty period repair, replace or otherwise remedy all defects due to faulty materials or workmanship. Where not noted otherwise, the period shall be one (1) year.

**1.42 FINAL COMPLETION SUBMITTALS**

- .1 Prior to final Application for Payment, complete and submit the following final completion submittals:
  - .1 Document Submittals: Submit to Owner documents required by authorities having jurisdiction.
  - .2 Project Record Drawings: Maintain and submit one set of prints of Contract Drawings and Shop Drawings.
    - .1 Mark Record Prints to show the actual installation where installation varies from that shown originally.

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- .2 Give particular attention to information on concealed elements that cannot be readily identified and recorded later.
- .3 Mark record sets with erasable, red-coloured pencil. Use other colors to distinguish between changes for different categories of Work at the same location.
- .4 Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location. Organize into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
- .3 Project Record Specifications: Submit one (1) copy of Project Manual, including Addenda and Contract Modifications. Mark copy to indicate actual products installed where installation varies from that indicated in Contract Documents, including Addenda and Contract Modifications.
  - .1 Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  - .2 Mark copy with the proprietary name and model number of products, materials and equipment furnished, including substitutions and product options selected.
- .4 Operating and Maintenance Data Submittals: Assemble 4 complete set(s) of operation and maintenance data indicating the operation and maintenance of each system, subsystem and piece of equipment not part of a system. Include operation and maintenance data required in individual Specification Sections and as follows:
  - .1 Operation Data: Include emergency instructions and procedures, system and equipment descriptions, operating procedures and sequence of operations.
  - .2 Maintenance Data: Include manufacturer's information, list of spare parts, maintenance procedures, maintenance and service schedules for preventive and routine maintenance, and copies of warranties and bonds.
  - .3 Organize operation and maintenance manuals into suitable sets of manageable size. Bind and index data in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, with pocket inside the covers to receive folded oversized sheets. Identify each binder on front and spine with the printed title "OPERATION AND MAINTENANCE MANUAL," Project name and subject matter of contents.
- .5 Guaranty and Warranty Submittals: Submit written guaranties and warranties prior to Final Completion Inspection.
  - .1 Organize warranty documents into an orderly sequence based on the Table of Contents of the Project Manual.
  - .2 Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents.

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- .6 Lien and Bonding Company Releases: Submit to Owner evidence of satisfaction of encumbrances on Project by completion and submission of documentation as directed. Signatures shall be notarized.
- .7 Other Submittals: Submit to Owner other submittals as required by Contract Documents including:
  - .1 Spare parts, extra materials, software, tools.
  - .2 Certificates of compliance.
  - .3 Testing, balancing, and commissioning reports.
  - .4 Maintenance contracts.
  - .5 Reports and documentation as required by authorities having jurisdiction.
  - .6 Insurance documentation.

**1.43 CLEAN UP**

- .1 As work proceeds and at the completion of the work each day remove all debris garbage and surplus material from the site.
- .2 Storage of debris will not be allowed overnight.
- .3 Obtain Owner's approval of the location(s) of disposal bin (s)
- .4 Cleaning of the area of the work shall include, but not be limited to:
  - .1 The removal of rubbish and other unsightly material and/or debris from the face of the building, adjacent ground areas, and from the roof and terrace surfaces.
  - .2 The removal of dust and other debris from the window frames and sills by brushing and/or other suitable methods.
- .5 Power sweep paved surfaces to remove earth contamination resulting from construction activities prior to final acceptance.

**1.44 MAKE GOOD**

- .1 Make good all damage resulting from work carried out under this Contract. Restore and blend to match surrounding existing conditions.
- .2 Unless otherwise specified or required by codes or by-laws to meet a certain requirement or both, make good new work to match existing work.
- .3 Where existing work is to be made good, the new work shall match the old work in material, construction and finish, unless otherwise noted or specified.
- .4 Leave landscaping, including sod, walkways, pavers, pots, flower beds, shrubs, trees, furniture, and the like, in a clean condition.

**1.45 SECURITY/SAFETY RESTRICTIONS**

- .1 A list of all contractors and subcontractors working on the project must be forwarded prior to the project start to the Engineer.
- .2 It is the Contractor's responsibility to maintain a clean and safe workplace.
- .3 Workers are required to wear proper safety protection. Safety boots are to be worn at all times. Hard hats are to be worn where overhead work is being performed. Eye, nose and ear protection is to be worn where required. Shirts must be worn at all times. No shorts are allowed.
- .4 There will be no smoking in any part of the building or meeting areas of the construction site.

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**1.46 COMMISSIONING REQUIREMENTS**

- .1 Summary
  - .1 Contractor is responsible for submitting Commissioning Plan for review in accordance with the requirements of this Section.
  - .2 Commissioning is additional to activities indicated including start-up, quality control, quality assurance, testing and balancing.
  - .3 Commissioning is a prerequisite requirement for Substantial Performance application.
- .2 Definitions
  - .1 "Commissioning": A planned program of tests, procedures and checks carried out systematically on systems and integrated systems of Work.
  - .2 "Commissioning Plan": This plan details the intent, responsibilities, extent and submittals of commissioning that will be used to ensure commissioning objectives are met.
  - .3 "Demonstrations": A test or simulation whereby evidence of properly functioning equipment or systems is provided by means of independent third party witnessing.
  - .4 "System State": A manually recorded snapshot of the system operation, including temperature, humidity, pressure, flow, amperes, actuator position, equipment efficiency.
- .3 Objectives
  - .1 Verify and provide documented evidence that installed equipment and systems operate in accordance with Contract Documents and design intent.
- .4 Commissioning Plan
  - .1 Provide a plan describing how the Work will be commissioned, including:
    - .1 Schedules: Provide a schedule of commissioning activities.
    - .2 Commissioning Check List: Prepare a check list of activities required to properly commission systems as indicated.
    - .3 Seasonal Adjustments and Tuning: Describe methodology for testing, verifying, and adjusting systems periodically throughout the year to ensure that the system operates as required in each season.
  - .2 Prepare Commissioning Plan in accordance with:
    - .1 ASHRAE-0: ASHRAE-0-2005 Guideline on The Commissioning Process.
    - .2 ASHRAE-1.1: ASHRAE-1.1-2007 Guideline on HVAC&R Technical Requirements for the Commissioning Process.
    - .3 ACG-CG: ACG Commissioning Guideline 2005.
- .5 Commissioning Extent
  - .1 Commission equipment and systems directly or indirectly impacted by Work unless otherwise indicated.
- .6 Demonstrations
  - .1 Demonstrations shall be witnessed by Engineer, Owner, or approved third party Commissioning Authority.
  - .2 Demonstrate minimum of 10% of distributed equipment or systems unless otherwise indicated.
  - .3 Demonstrate 100% of equipment with quantities less than ten (10).

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- .4 Demonstrate performance including:
    - .1 System is working in accordance with design intent.
    - .2 Capacity, staging control, and efficiency of equipment at full and part load scenarios.
    - .3 Modes of operation for all equipment and systems.
    - .4 Interlocks including fire alarm, equipment fail-safe, over-current, over-vibration, flow, low level, over temperature, over pressure, gas detection, and other life safety interlocks or safeties required for safe operation.
  - .5 Equipment failure modes and test consequences and responses.
  - .6 Other demonstrations upon request.
  - .7 Commissioning Submittals
    - .1 Commissioning Plan for Approval.
    - .2 Revisions to Commissioning Plan as required.
    - .3 Documentation on commissioning activities.
    - .4 Documentation of System State at full and part load conditions for the following states and modes of operation:
      - .1 Start-up conditions.
      - .2 Normal operating conditions.
      - .3 Simulated maximum capacity.
      - .4 Simulated minimum capacity.
      - .5 All other modes of operation.
    - .5 Letter certifying that Work has been installed and commissioned according to Contract Documents.
    - .6 Submittals shall include the time, date, and the person(s) who completed commissioning activities.
  - .8 Commissioning Procedures
    - .1 Submit Commissioning Plan for approval minimum 20-days prior to commissioning.
    - .2 Revise Commissioning Plan as required to the satisfaction of Engineer.
    - .3 Complete commissioning activities according to approved schedule.
    - .4 Submit commissioning submittals and schedule and arrange demonstrations as required.
    - .5 Facilitate demonstrations.
- 1.47 CORRECTION PERIOD**
- .1 Correction Period: 12-month period starting at date of Substantial Performance of Work. Contractor agrees to pay for any damages and to correct promptly, at Contractor's own expense, defects or deficiencies in Work which appear prior to and during the Correction Period, or such longer periods as may be specified for certain products or systems.

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- .2 Contractor warrants that Work, including all products and components thereof, shall conform to the Specifications and Drawings, set out in Contract Documents, in all respects and shall be new, or good quality Material, of merchantable quality and fit for their intended purpose, as described and specified in Contract Documents and free of defects in Materials and workmanship for Correction Period. Contractor shall extend the warranty on replaced parts and workmanship for a period of 12 months from date of acceptance of the replacement parts and/or workmanship.
- .3 This warranty shall cover labour and Material, including, without limitation, the costs of removal and replacement of covering Materials. This warranty shall not limit extended warranties on any items of equipment or Material called for elsewhere in the Specifications and Drawings or otherwise provided by any manufacturer of such equipment or Material.

**End of section 01 00 00**

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## **PART 1 - GENERAL**

### **1.1 SECTION INCLUDES**

- .1 Coordination.
- .2 Meetings.

### **1.2 COORDINATION**

- .1 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.
- .2 All storage of materials, access, traffic, and parking facilities will be located in the West parking lot. Contractor must not block Fire Hall entrance and exit or main entrance without Building Manager's approval.
- .3 During construction, coordinate use of site and facilities in cooperation with Owner. Completely follow through with all procedures for submittals, reports, records, schedules, coordination of drawings, recommendations, resolution of ambiguities, and settling of conflicts according to the Contract Documents.
- .4 Provide information required for preparation of coordination drawings. Review and approve revised drawings for submission to Engineer.
- .5 Work shall be coordinated in a manner that avoids interference with daily operation of the building. Minimize disruption to Building Manager's satisfaction. Contractor shall assume that the facility will be in full operation for the entire duration of the contract.
- .6 No smoking shall be permitted within the building. Contractor and Building Manager must agree on a designated smoking area away from the building.

### **1.3 PRECONSTRUCTION MEETING**

- .1 Within five (5) days after award of Contract, request a meeting of parties in Contract to discuss and resolve administrative procedures and responsibilities.
- .2 Owner's representative, Engineer, Contractor and major Subcontractors to be in attendance.
- .3 Establish time and location of meeting and notify parties concerned minimum five (5) working days before meeting.
- .4 Review with Owner and Engineer all mutually agreed variations to the Contract Documents that are incorporated into the Agreement.



- .5 Agenda to include the following:
  - .1 Appointment of official representatives of participants in the Work.
  - .2 Schedule of Work, progress scheduling.
  - .3 Schedule of submission of shop drawings, samples, colour chips.
  - .4 Requirements for temporary facilities, offices, storage sheds, utilities, fences.
  - .5 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
  - .6 Take-over procedures, acceptance, warranties.
  - .7 Monthly progress claims, administrative procedures, holdbacks (GC).
  - .8 Transcript of insurance policies.
  - .9 Submit schedule of value.

#### **1.4 PROGRESS MEETINGS**

- .1 During course of Work and one (1) week prior to project completion schedule a progress meeting.
- .2 Engineer's representative shall record the meeting minutes. Type, reproduce and distribute copies of minutes to all meeting participants and those otherwise identified by the Owner, Engineer or Contractor as requiring same.
- .3 Contractor, major Subcontractors involved in Work, Engineer, and Owner's representative are to be in attendance.
- .4 Notify parties minimum five (5) days prior to meetings.
- .5 Agenda to include the following:
  - .1 Review, approval of minutes of previous meeting.
  - .2 Review of Work progress since previous meeting.
  - .3 Field observations, problems, and conflicts.
  - .4 Problems that impede construction schedule.

**End of section 01 31 00**

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## **PART 1 - GENERAL**

### **1.1 SECTION INCLUDES**

- .1 Administration
- .2 Shop drawings and product data.
- .3 Samples.
- .4 Certificates and transcripts.

### **1.2 ADMINISTRATION**

- .1 Submit to Engineer submittals listed for review promptly and in orderly sequence to avoid any delay in the Work. Failure to submit in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such failure will be allowed.
- .2 Work affected by the submittal shall not proceed until review is complete.
- .3 Review all submittals prior to submission to the Engineer. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with the requirements of the Work and the Contract Documents. Submittals not stamped, signed, dated and identified as to the specific project will be returned without being examined and shall be considered rejected.
- .4 Verify field measurements and affected adjacent work is coordinated.
- .5 Contractor's responsibility for errors and omissions in submission is not relieved by Engineer's review of submittals.
- .6 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Engineer's review.
- .7 Keep one reviewed copy of each submission on site.

### **1.3 SHOP DRAWINGS AND PRODUCT DATA**

- .1 The term "Shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by the Contractor to illustrate details of a portion of the Work.
- .2 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of the Section under which the adjacent items will be supplied and installed. Indicate cross-references to design drawings and specifications.

- .3 Adjustments made on shop drawings by the Engineer are not intended to change the Contract Price. If adjustments affect the value of Work, state such in writing to the Engineer prior to proceeding with the Work.
- .4 Make changes in shop drawings as the Engineer may require, consistent with Contract Documents. When resubmitting, notify the Engineer in writing of any revisions other than those requested. Submit interference drawings as required by the Owner and/or Engineer.
- .5 Submit one transparency and three (3) prints of shop drawings for each requirements requested in specification Sections and as the Engineer may reasonably request.
- .6 Submit six (6) copies of product data sheets or brochures for requirements requested in specification Sections and as the Engineer may request where shop drawings will not be prepared due to standardized manufacture of product.
- .7 If upon review by the Engineer, no errors or omissions are discovered or if only minor corrections are made, the transparency will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and re-submission of corrected shop drawings, through the same procedure indicated above, shall be performed before fabrication and installation of Work may proceed.
- .8 All shop drawings shall be designed and stamped by a licenced Professional Engineer having jurisdictions in the Province of Ontario.

#### **1.4 SAMPLES**

- .1 Submit for review samples in triplicate as requested in respective specification Sections. Label samples as to origin and intended use in the Work.
- .2 Deliver samples prepaid to Engineer's business address.
- .3 Notify the Engineer in writing, at the time of submission, of any deviations in samples from requirements of Contract Documents.
- .4 Adjustments made on samples by the Engineer are not intended to change the Contract Price. If adjustments affect the value of Work, state such in wiring to the Engineer prior to proceeding with the Work.
- .5 Make changes in samples that the Engineer may require, consistent with Contract Documents.

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## **1.5 CERTIFICATES AND BONDS**

- .1 Immediately after award of Contract, and not later than the preconstruction meeting, submit to Engineer: Workplace Safety and Insurance Board (WSIB) Clearance Certificate, Certificate of Insurance and required Bonds.
- .2 Upon expiration of any certificate, immediately provide new valid certificate to the Owner and Engineer.
- .3 Contractor shall notify all bonding authorities and insurance provider, on a regular and frequent basis, of all changes to the Work and mutually agreed variations to the Contract Documents. Written copies of such notices shall be copied to both the Owner and Engineer.

**End of Section 01 33 00**

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## **PART 1 - GENERAL**

### **1.1 SECTION INCLUDES**

- .1 Cleaning.
- .2 Project record documents.
- .3 Spare parts and maintenance materials.
- .4 Take over procedures.

### **1.2 PROGRESSIVE CLEANING**

- .1 Maintain the work in tidy condition, free from accumulation of waste products and debris.
- .2 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .3 Remove waste material and debris from the site and deposit in waste container at the end of each working day.
- .4 Clean interior areas prior to start of finish work; maintain areas free of dust and other contaminants during finishing operations.

### **1.3 FINAL CLEANING**

- .1 Remove waste products and debris and leave the work clean and suitable for occupancy by Owner.
- .2 Remove surplus products, tools, construction machinery and equipment. Remove waste products and debris other than that caused by the Owner or other Contractors.
- .3 Clean and polish all exposed glass surfaces and metal frames affected by the Work. Replace broken, scratched or disfigured glass.
- .4 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, floors and ceilings other than that which is caused by the Owner or other Contractors.
- .5 Broom clean and wash exterior walks, steps and surfaces other than that which is caused by the Owner or other Contractors.

### **1.4 PROJECT RECORD DOCUMENTS**

- .1 Submit one copy of complete volumes in final form seven (7) days prior to Substantial Performance.
- .2 Copy will be returned with Engineer's comments. Revise contents of documents as required prior to final submittal.

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- .3 One (1) weeks prior to Substantial Performance of the Work submit to the Engineer two (2) final copies of operating and maintenance manuals.
- .4 Organize data in the form of an instructional manual in binders of commercial quality, 8 1/2 x 11 inch maximum ring size.
- .5 Cover: identify each binder with typed or printed title AProject Record Documents@; list title of Project, identify subject matter of contents.
- .6 Arrange contents under Section numbers and sequence for Table of Contents.
- .7 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .8 Drawings: Provide with reinforced punched bind tab. Bind in with text; fold larger drawings to size of text pages.
- .9 For Each Product or System: List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .10 Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information.

## 1.5 FINAL INSPECTION AND DECLARATION PROCEDURES

- .1 Contractor's Inspection: The Contractor and all Subcontractors shall conduct an inspection of the Work, identify deficiencies and defects; repair as required. Notify the Engineer in writing of satisfactory completion of Contractor's Inspection and that corrections have been made. Request a Engineer's Inspection.
- .2 Engineer's Inspection: Engineer and Contractor will perform an inspection of the Work to identify obvious defects or deficiencies. The Contractor shall immediately correct Work accordingly.
- .3 Final Inspection: When the items noted above are completed, request a final inspection of the Work by the Owner and Engineer. If the Engineer deems Work incomplete, complete the outstanding items and request a re-inspection.
- .4 Declaration of Substantial Performance: When the Engineer considers deficiencies and defects have been corrected and it appears requirements of the Contract have been substantially performed, make application and publish for certificate of Substantial Performance.
- .5 Commencement of Lien and Warranty Periods: The date of the Owner's acceptance of the submitted declaration of Substantial Performance shall be the date for commencement for the warranty period and commencement of the lien period unless required otherwise by the lien statute of the Place of Work.

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- .6 Declaration of Total Performance: When the Owner and Engineer consider final deficiencies and defects have been corrected and it appears requirements of the Contract have been totally performed make application for certificate of Total Performance. Refer to General Conditions Article GC 5.7 for specifics to application. If the Owner and or Engineer deem Work incomplete, complete the outstanding items and request a re-inspection.
- .7 Final Payment: Following completion of the lien period, submit claim for final payment in accordance with the General Conditions.

**End of section 01 70 00**

## **PART 1 - GENERAL**

### **1.1 SECTION INCLUDES**

- .1 Administrative procedures preceding preliminary and final inspections of the Work.

### **1.2 INSPECTION AND DECLARATION PROCEDURES**

- .1 Contractor's Inspection: Contractor and all Subcontractors shall conduct an inspection of the work, identify deficiencies and defects; repair as required to conform to Contract Documents. Notify Engineer in writing of satisfactory completion of Contractor's Inspection and that corrections have been made. Request a Engineer's Inspection.
- .2 Engineer's Inspection: Engineer and Contractor will perform an inspection of the Work to identify obvious defects or deficiencies. Contractor shall correct Work accordingly.
- .3 Completion: submit a written certificate that the following have been performed:
  - .1 Work has been completed and inspected for compliance with Contract Documents.
  - .2 Defects have been corrected and deficiencies have been completed,
  - .3 Work is complete and ready for Final Inspection.
- .4 Final Inspection: When items noted above are completed, request a final inspection of the Work by Owner, Engineer, and Contractor. If Engineer deems Work incomplete, complete outstanding items and request a re-inspection.
- .5 Declaration of Substantial Performance: When Engineer considers deficiencies and defects have been corrected and it appears requirements of Contract have been substantially performed, make application for certificate of Substantial Performance in accordance with the City of Guelph requirements.
- .6 Commencement of Lien and Warranty Periods: Date of publication of Substantial Performance Certificate shall commence both the Warranty period and Lien period strictly in accordance with the Construction Lien Act.
- .7 Declaration of Total performance: When the Owner and Engineer consider final deficiencies and defects have been corrected and it appears requirements of Contract have been totally performed make application for certificate of Total Performance in accordance with the City of Guelph requirements.
- .8 Final Payment: Following completion of lien period, submit claim for final payment in accordance with the City of Guelph requirements.



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### **1.3 RE-INSPECTION**

- .1 Should status of the Work require re-inspection by Engineer due to failure of Work to comply with Contractor's claims for inspection, Owner may deduct amount of Engineer's compensation for re-inspection services from payment to Contractor in accordance with the City of Guelph requirements.

**End of section 01 77 00**

## **PART 1 - GENERAL**

### **1.1 STANDARDS**

- .1 Read and conform to the requirements in Division 1 which form an integral part of the specifications.
- .2 This section specifies the work related to the removal and disposal of existing roofing system and sheet metal as well as existing glazing sealants.

### **1.2 EXISTING CONDITION**

- .1 Adjacent areas which are not part of this contract shall be maintained in good condition before, during and after the construction activity.
- .2 Should any suspected designated substances be encountered, work shall stop and the Engineer shall be notified. Work shall not proceed thereafter until a written notice issued by the Engineer.

### **1.3 PROTECTION**

- .1 Fire Extinguishers: maintain one, ULC labelled extinguisher for A, B and C class protection, one roof per torch applicator, within 10 m of torch application area.
- .2 Maintain fire watch for two (2) hours after each day's roofing operations cease.
- .3 It is the responsibility of the contractor to prevent any damage to the adjacent buildings and their services as well as the working area.
- .4 During construction work, exposed surfaces of finished walls shall be protected with tarps in order to prevent damage. The contractor shall assume full responsibility for any damage.
- .5 Prevent movement or damage of adjacent parts of existing structure to remain. Provide bracing and shoring as required. Repair or replace damage caused by demolition to the satisfaction of the Engineer.
- .6 Protect adjacent structures and property against damage which might occur from falling debris or other causes.
- .7 Do not interfere with the use of adjacent structures and work areas. Maintain a free and safe passage to and from adjacent structures and work areas.
- .8 If movement or settlement occurs, install further bracing and shoring as necessary and repair or replace damage to the satisfaction of the Engineer
- .9 Prevent debris from blocking surface drainage system, elevators, mechanical and electrical systems which must remain in operation.

- .10 Pay particular attention to prevention of fire and elimination of fire hazards which would endanger the work or adjacent structures and premises.
- .11 Provide adequate protection for materials to be re-used. Set them on ground and free from moisture pick-up. Cover stockpiles of materials with tarps.
- .12 Close off access to areas where demolition is proceeding by barricades and post warning signs.
- .13 Provide and maintain all legal and necessary barricades, guards, railings, light, warning signs, security personnel and other safety measures and fully protect all persons and property.
- .14 Take every possible precaution to prevent dust, dirt and water from demolition operations entering operational areas.

#### **1.4 SUBMITTALS**

- .1 Submit written demolition procedures, including protection measures for existing building and equipment, prior to demolition work.

### **PART 2 – PRODUCTS**

#### **2.1 MATERIALS**

- .1 Remove, handle and transport products indicated to be removed and stored for future use. Transport products to storage area(s) designated by Engineer. Perform work carefully and with diligence to prevent any damage to products during removal and in storage. Products that are damaged during removal will be subject to inspection by the Engineer. The Engineer will determine the extent of damage and either accept or refuse products to be reused.

### **PART 3 - EXECUTION**

#### **3.1 GENERAL**

- .1 Materials requiring demolition become Contractor's property and must be removed from the site daily, unless such materials are otherwise specified to be reused or turned over to Engineer or Building Manager.
- .2 Stockpiling of rubble, debris and surplus materials on site will not be permitted.

#### **3.2 PREPARATION**

- .1 Applicable warning signs must be posted prior to the start of the construction activities.

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- .2 Mechanical and electrical services shall be disconnected by approved contractors in accordance with the requirements of the local authority having jurisdiction.
- .3 The Engineer shall be notified of any disconnection 72 hours in advance.
- .4 Mechanical and electrical services shall be re-connected by approved contractors to their original conditions as required at the contractor's expense.

### 3.3 DEMOLITION

- .1 Demolish and remove materials as instructed in related sections.
- .2 Perform work in a manner so as not to inconvenience persons outside those parts which are to be demolished.
- .3 Demolish to minimize dusting. Keep work area wetted down with fog sprays to prevent dust and dirt rising. Provide temporary water lines and connections that may be required. Upon completion, remove installed temporary water lines.
- .4 Do not sell or burn materials on site.
- .5 Remove existing equipment, services and obstacles where required for refinishing or making good of existing surfaces and replace as work progresses.
- .6 Concrete:
  - .1 Demolish concrete by methods which avoid impact loads on items which are not to be demolished.
  - .2 Where only part or parts of the concrete slab or other items are to be demolished, use saw cuts to isolate areas which are to be demolished except where existing reinforcing steel is to be left in place. Prior to such isolating, provide suitable support to prevent premature movement of area and undesirable transfer of loads as cutting progresses. If necessary, remove area to be demolished by successively isolating small sections.
- .7 Remove existing services and barriers as required and restore when construction work is completed at the Contractor's expense.
- .8 At the end of each working day, the work site must be left in safe condition. Protect all surrounding areas as required.

**End of section 02 40 00**

## **PART 1 - GENERAL**

### **1.1 RELATED WORK**

- .1 Section 07 52 00 Modified Bituminous Membrane Roofing
- .2 Section 07 62 00 Sheet Metal Flashing and Trim

### **1.2 STANDARDS**

- .1 Read and conform to the requirements in Division 1 which form an integral part of the specifications
- .2 This section specifies the work related to the installation of parapet details and the repairs to exterior fascia.

### **1.3 EXISTING CONDITION**

- .1 Adjacent areas which are not part of this contract shall be maintained in good condition before, during and after the construction activity.
- .2 Should any suspected designated substances be encountered, work shall stop and the Engineer shall be notified. Work shall not proceed thereafter until a written notice issued by the Engineer.

### **1.4 QUALITY ASSURANCE**

- .1 Lumber identification: by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.
- .2 Plywood, particleboard, OSB and wood based composite panels in accordance with CSA and ANSI standards.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

Lumber: unless specified otherwise, softwood, S4S, moisture content 19% (S-dry) or less in accordance with following standards:

- .1 CAN/CSA-O141.
- .2 NLGA Standard Grading Rules for Canadian Lumber.
- .3 Wood Blocking: Pressure treated grade - All pressure treated wood materials shall bear the stamp of the Canadian Wood Preservers Bureau and meet CSA-080 standards.

- .4 Plywood: 12.7 mm thick, pressure treated grade - To CSA O151, standard construction.

## **2.2 FASTENER FINISHES**

- .1 Galvanizing: to CAN/CSA-G164, use galvanized fasteners for pressure-preservative.
- .2 Nails, spikes and staples to CSA B111-1974.
- .3 Bolts: 12.5 mm diameter unless indicated otherwise.

## **2.3 WOOD PRESERVATIVE**

- .1 Preservative: to CAN/CSA-O80 Series, stained finish.
- .2 Fire-Retardant: to CAN/CSA-O80.20.

# **PART 3 - EXECUTION**

## **3.1 CONSTRUCTION**

- .1 Comply with requirements of NBC 1995 Part 9 supplemented by following paragraphs.
- .2 Comply with requirements of Ontario Building Code.
- .3 Install all wood blocking and plywood in strict accordance with the details drawings.
- .4 Install members true to line, levels and elevations, square and plumb.
- .5 Construct continuous members from pieces of longest practical length.
- .6 Install spanning members with "crown-edge" up.

## **3.2 FURRING AND BLOCKING**

- .1 Furring and blocking shall be installed to space out and provide solid support to facings, metal counter flashings.
- .2 Align and plumb faces of furring and blocking to tolerance of 1:600

## **3.3 NAILING STRIPS, GROUNDS AND ROUGH BUCKS**

- .1 Rough bucks, nailers and linings to rough openings shall be installed to provide solid support for frames and other work.

### **3.4 FASTENERS**

- .1 Install wood cants, fascia backing, nailers, curbs and other wood supports as required and secure using galvanized fasteners.
- .2 Anchor and fasten, tie and trace members to provide necessary strength.
- .3 Re-secure all loose wood fascia throughout as instructed by the Engineer.

### **3.5 SURFACE APPLIED WOOD PRESERVATIVE**

- .1 Re-treat surfaces that were exposed during cutting, trimming or boring with liberal brush application of preservative before installation.

**End of section 06 10 00**

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## **PART 1 - GENERAL**

### **1.1 REFERENCES**

- .1 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-37.5-[M89], Cutback Asphalt Plastic Cement.
  - .2 CGSB 37-GP-9Ma-[83], Primer, Asphalt, Unfilled, for Asphalt Roofing, Dampproofing and Waterproofing.
  - .3 CGSB 37-GP-15M-[76], Application of Asphalt Primer for Asphalt Roofing, Dampproofing and Waterproofing.
  - .4 CGSB 37-GP-19M-[76], Cement, Plastic, Cutback Tar.
  - .5 CAN/CGSB-37.29-[M89], Rubber-Asphalt Sealing Compound.
  - .6 CGSB 37-GP-56M-[80], Membrane, Modified, Bituminous, Prefabricated, and Reinforced for Roofing.
  - .7 CAN/CGSB-51.26-[M86], Thermal Insulation, Urethane and Isocyanurate, Boards, Faced.
  - .8 CAN/CGSB-51.31-[M84], Thermal Insulation, Mineral Fibre Board for Above Roof Decks.
  - .9 CAN/CGSB-51.33-[M89], Vapour Barrier Sheet, Excluding Polyethylene, for Use in Building Construction.
- .2 Canadian Standards Association (CSA)
  - .1 CSA A123.3-[M1992], Asphalt or Tar Saturated Roofing Felt.
  - .2 CSA A123.4-[M1992], Bitumen for Use in Construction of Built-Up Roof Coverings and Dampproofing and Waterproofing Systems.
  - .3 CSA A231.1-[1972], Precast Concrete Paving Slabs.
  - .4 CAN/CSA-A247-[M86], Insulating Fibreboard.
  - .5 CSA A284-[1976], Mineral Aggregate Thermal Roof Insulation.
  - .6 CSA O121-[M1978], Douglas Fir Plywood.
  - .7 CSA O151-[M1978], Canadian Softwood Plywood.

### **1.2 SHOP DRAWINGS**

- .1 The Contractor shall submit shop drawing(s) upon request by the Engineer. All shop drawings shall be designed and stamped by a licensed Professional Engineer having jurisdictions in the Province of Ontario.
- .2 Submit two copies of all shop drawings. Shop drawings shall indicate installation method, materials, size, slope of tapered insulation and the tapered layout for positive drainage, etc...
- .3 No fabrication and or installation shall commence until all shop drawings have been approved by the Engineer.

### **1.3 COMPLEMENTARY WORK**

- .1 Metal flashing and accessories.



#### **1.4 CONTRACTOR QUALIFICATIONS**

- .1 The roofing contractor shall be, during the bidding period as well as during installation, officially recognized as an approved applicator by the roofing materials manufacturer.
- .2 Roofing work shall be performed only by skilled applicators, employed by a company operating all adequate and necessary equipment to execute such work.

#### **1.5 MANUFACTURER'S REPRESENTATIVE**

- .1 The roofing materials manufacturer can delegate a representative to visit the work site at commencement of work. It is anticipated that the manufacturer will assign a technical representative to visit the site during the execution of the work to ascertain proper application of their products. The said representative shall inform the Engineer of their visits.
- .2 At all times, the contractor shall permit and facilitate access to the work site and roofs to said manufacturer's representative.

#### **1.6 STORAGE AND HANDLING**

- .1 All materials shall be delivered and stored in their original packaging, bearing the manufacturer's name, related standards and any other specification or reference accepted as standard.
- .2 All materials shall be adequately protected and permanently stored in a dry, well ventilated and weatherproof location. Only materials to be used the same day shall be removed from this location. During winter, materials shall be stored in a heated location with a 10 degree Celsius. minimum temperature, removed only as needed for immediate use. Materials shall be kept away from open flame or welding sparks.
- .3 Materials delivered in rolls shall be carefully stored on end, with selva edges up. Metal flashings and counter-flashings shall be stored in such a way as to prevent wrinkling, twisting, scratches and other damage.
- .4 The contractor shall avoid stock piling of materials on roofs, which could, at certain places, affect the loading of such roofs. Avoid dropping materials and equipment on roofs at all times, as building's daily operations will continue during roofing work.
- .5 Provide and maintain dry, off-ground weatherproof storage.
- .6 Store rolls of felt and membrane in upright positions. Store membrane rolls with selva edges up.
- .7 Remove only in quantities required for same day use.
- .8 Place plywood runways over work to enable movement of material and other traffic.

- .9 Store sealants at +5 degrees Celsius minimum.
- .10 Store all insulation panels protected from weathering elements and deleterious materials.

## 1.7 ENVIRONMENTAL REQUIREMENTS

- .1 Do not install roofing when temperature remains below -18 degrees Celsius for torch application, or to manufacturers' recommendations for mop application.
- .2 Minimum temperature for solvent-based adhesive is -5 degrees Celsius.
- .3 Install roofing on dry deck, free of snow and ice, use only dry materials and apply only during weather that will not introduce moisture into roofing system.

## 1.8 PROTECTION

- .1 During roofing work, exposed surfaces of finished walls shall be protected with tarps in order to prevent damage. The contractor shall assume full responsibility for any damage.
- .2 Fire Extinguishers: maintain one, ULC labeled extinguisher for A, B and C class protection, on roof per torch applicator, within 10 m of torch application area.
- .3 Maintain fire watch **for three (3) hours** after each day's roofing operations cease.

## 1.9 WARRANTIES

- .1 The product manufacturer shall supply the owner with a written and signed document, certifying the performance of his/her products and the consistency of the properties of such products affecting their performance for a period of **ten (10) years** from date of acceptance. The manufacturer's warranty shall be a system warranty.
- .2 The roofing contractor shall supply the owner with a written and signed document, certifying that all work completed shall remain as installed, free from any roofing defect, for a period of **two (2) years** from date of acceptance. The warranty document shall state that the roofing contractor will be responsible for the repair of any defects within the roofing system and/or damages caused to the building elements and occupant's belonging as a result of roofing defects and/or leaks for the duration of the warranty period.

## 1.10 COMPATIBILITY

- .1 Compatibility between components of the new roofing system is essential. Provide written declaration from material's manufacturer to Engineer, stating that materials and components, as assembled in system, meet this requirement.

## 1.11 SAFETY

- .1 Contractors to comply to Occupational Health and Safety Act and regulations for Construction Projects particularly but not limited to the following:
  - .1 All workers working above three meters must comply with the requirements for a fall arrest system in section 26 of the regulation.
  - .2 All ladders used on the project must comply with section 78-83 of the regulations.
  - .3 Comply with section 125-142 for scaffolding, section 209 for hoisting and section 207 for safety barriers as stipulated in the regulations.
  - .4 The contractor shall provide a minimum of two hours fire watch after all torching applications are complete.
  - .5 The contractor shall comply with all Provincial and Local Fire code and regulations.
- .2 Comply with provisions of The Occupational Health and Safety Act (latest edition): Regulations for Construction Projects; Construction Safety Act; regulations of the Ontario Ministry of Labour; Workplace Hazardous Materials Information System (WHMIS) Regulation; and the Canadian Construction Safety Code (latest edition), and all amendments. Follow the recommendations of The Construction Health and Safety Manual issued by the Construction Safety Association of Ontario.
- .3 The Contractor shall work in conjunction with the proper safety associations operating under the authority of the Ontario Workers Compensation Act. The Contractor shall not, in any manner, endanger the safety or unlawfully interfere with the convenience of the public.
- .4 Before commencement of Work, and throughout Contract, maintain on Site readily accessible to those who may be exposed to hazardous materials, a list of all hazardous materials proposed for use on Site, or Workplace, together with current Material Safety Data Sheets (MSDS).
- .5 Provide Engineer with a copy of the list of hazardous materials and MSDS as required.
- .6 Safety precautions are part of the construction techniques and processes for which the Contractor is solely responsible.
- .7 Erect and maintain fencing, overhead protection hoardings and barricades in accordance with governing regulations and as required to ensure public safety.
- .8 Maintain all public, fire and maintenance access to and from the building and parking garage.

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- .9 Construct and maintain hoardings, covered ways and protective canopies as required to maintain access to the building and provide public safety.
- .10 The Contractor shall provide and pay for the design and preparation of all required shop drawings pertaining to the hoardings, covered ways, tie backs and protective canopies.
- .11 Smoking on site is not permitted, except where so designated by Owner.
- .12 Provide a minimum of three (3) safety helmets for authorized visitors to the workplace.
- .13 Protect public, staff and those on the Work from injury. Equipment when not in use shall have keys removed and locked up in secure location.

## 1.12 QUALITY ASSURANCE

- .1 Upon request from the owner, the elastomeric asphalt manufacturers shall supply, at their expense, the results of mechanical and chemical testing performed on the elastomeric asphalt materials supplied.
- .2 The tests shall be performed to certify compliance with CGSB 37-GP-56M standard.

## **PART 2 - PRODUCTS**

Products specified herein are based on material manufactured by Soprema. Similar products by Bakor, IKO and Johns Manville are acceptable. Applicators seeking approvals for approved equal materials shall submit their request to the Engineer in writing at least five (5) days before closing of bids. Request shall include complete product's list and system description.

## 2.1 MATERIALS

- .1 **Asphalt Primer:** ELASTOCOL STICK, ELASTOCOLE 500 by Soprema Inc.
- .2 **Gypsum Sheathing, Tape, Fasteners & Plates:**
  - .1 **Gypsum Board:** 15.8 mm (5/8") gypsum board sheathing to ASTM C 36 "Type X" Fire Rated. Approved Manufacturers: Canadian Gypsum Co. Ltd., Georgia-Pacific Westroc, Inc. & G. P. Gypsum Corporation.
  - .2 **Sheathing Tape:** 6" CON STOP kraft tape by Convoy Supply Ltd.
  - .3 **Fasteners:** 1½" - #12 ROOFGRIP® by Buildex, #3 Phillips head style, SPEXTM coated, Thread Form Modified Buttress, Drilling Capacity 18-26 Gauge Metal Deck.

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- .4 **Plates:** Flat Bottom Metal, Galvalume, 3" x 3" Square, for use with hard board/rigid insulation, by Buildex.
- .2 **Vapour Retarder:** **SOPRAGLASS 100** - Composed of glass fleece reinforcement and oxidised bitumen. Both sides of the membrane shall be sanded.
- .3 **Roofing Thermal Insulation:**
  - .1 **Overlay Layer:** 12.7 mm (0.5") High Density Fibreboard Insulation, top face coated with asphalt, to CSA A247-M86. High Density Fibreboard insulation shall have a minimum compressive strength of 45 P.S.I (310 Kpa) using test method ASTM-C165. Approved Manufacturers: IKO Industries, EMCO & Lexcan.
  - .2 **Base Layer:** ENRGY 3<sup>®</sup> - 84 mm (3.3") Polyisocyanurate Insulation. Approved Manufacturer: Johns Manville.
  - .3 **Tapered Insulation:** Install 2,440 mm x 2,440 mm polyisocyanurate tapered insulation around all roof drains with a minimum slope of 2% towards the drain. Approved Manufacturers: Accuplane & Posi-Slope.
- .4 **Roofing Membrane:**
  - .1 Modified SBS Base Sheet: Elastophene 180 PS, by Soprema, 2.2 mm thick, top surface to have thermofusible plastic, bottom surface to be sanded.
  - .2 Modified SBS Cap Sheet: Sopralene Flam 250 GR, by Soprema, 4 mm thick, thermofusible plastic film on the underside and granulated on top.
- .5 **Membrane Flashing (Stripping):**
  - .1 Modified SBS Base Flashing: Elastophene 180 PS, by Soprema, 2.2 mm thick, top surface to have thermofusible plastic, bottom surface to be sanded.
  - .2 Modified SBS Cap Flashing: Sopralene Flam 250 GR, by Soprema, 4 mm thick, thermofusible plastic film on the underside and granulated on top.
- .6 **Wood Blocking:** Pressure treated grade - All pressure treated wood materials shall bear the stamp of the Canadian Wood Preservers Bureau and meet CSA-080 standards.
- .7 **Plywood:** 12.7 mm thick, pressure treated grade - To CSA O151, standard construction.
- .8 **Fibre Cant Strip:** 3 inch by 3 inch fibre cants.
- .9 **Drain Inserts:** Thaler drain inserts complete with anti back-up device by U-Flow Canada and control flow device.

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- .10 **Stack-Jacks:** Spun aluminum insulated stack-jacks by Lexuco.
- .11 **Electrical Stack Jacks:** MEF-AE4 Multiple Flexible Conduit Flashing Stacks and MEF-AE1 Rigid Conduit Flashing by Thaler.
- .12 **Gas Line Stack Flashing:** Spun aluminum, insulated stack flashing complete with EPDM triple pressure grommet seal. Size: stack flashing diameter to match the diameter of the existing gas line. Approved manufacturer: Thaler.
- .13 **Tall Cones:** Flash-Tile B-Vent Flashing, pre-formed metal, insulated by Lexuco.
- .14 **Gas Line/Conduit Supports:** Super Sleeper, Model SS-8R, by Portable Pipe Hangers, adhered and placed on 25.4 mm Extruded Polystyrene Type IV insulation padding, spaced at locations and intervals as required by Technical Standard & Safety Authority (TSSA).
- .15 **Sealant:** Dymonic by Tremco
- .16 **Sheet Metal:** 24 gauge Stelco 8,000 series, colour to be chosen from the standard range. Colour to be chosen by the Owner at a later date.
- .17 **Concrete Paving Slabs:** To CSA A231.1, 619 mm x 619 mm x 51 mm thick, plain grade, natural precast concrete paving slabs having non slip finish.
- .18 **Insulation Padding:** 25.4 mm Extruded Polystyrene Type IV insulation.
- .19 **Self Adhesive Air Barrier and Underlayment Sheet:** Sopralene Flam Stick by Soprema Inc. Top surface shall have thermofusible plastic film, bottom surface shall have silicon release film.
- .20 **Exposed Fasteners:** Stainless steel or cadmium plated, self-tapping sheet metal screws with colour matched nylon heads. Pre-painted to match the colour of the new sheet metal flashing.
- .21 **Bitumen:** Type 2 asphalt for slopes of 1:4 to 1:8 and Type 3 asphalt for greater slopes. Asphalt: to CSA - A123.4-M. Provide scent additives as required to reduce odour.
- .22 **Batt Insulation:** Fibre Glass batt insulation by Owens Corning.
- .23 **Pitch Pocket:**
  - .1 Description: Pitch pocket must be composed of prefabricated interlocking curbs, a single component elastomeric polyurethane sealant and a fast setting, solvent free mastic that sets within minutes of application.

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.2 Specified products:

- .1 Inter Clip – prefabricated interlocking curbs, by Soprema
- .2 IC Sealant, by Soprema
- .3 IC Duomastic, by Soprema

## **PART 3 - EXECUTION**

### **3.1 SURFACE INSPECTION AND PREPARATION**

- .1 Remove all existing roofing components down to the structural deck.
- .2 Before commencing work, the owner's representative, together with the Engineer shall inspect and approve the deck condition as well as the parapet walls, roof drains, vent outlets and others.
- .3 Before commencing work, all surfaces must be smooth, dry, clean and free of ice, and debris. No salt or calcium shall be used to remove ice or snow.
- .4 Do not install materials in conditions of rain, snow or fog.

### **3.2 INSTALLATION**

- .1 Install roofing elements on clean and dry surfaces, in accordance with the manufacturer's requirements and recommendations.
- .2 Roofing work shall be performed on a continuous basis as surface and weather conditions allow.
- .3 Adjoining surfaces shall be protected against any damage that could result from the roofing installation.
- .4 Apply only as much insulation to the roof as can be covered the same day with roofing membrane. At the conclusion of each working day, seal exposed edges of the roof insulation. This seal shall be cut and removed upon continuation of the work.

### **3.3 GYPSUM BOARD INSTALLATION (Roofing System "R1" Only)**

- .1 Mechanically fasten to existing steel deck with screws spaced 400 mm o/c each way, or as specified by the material manufacturer's printed instructions. Stagger all sheets at minimum half sheet distances between consecutive rows. Minimum fastener penetration to the underside of the steel deck shall be 25.4 mm.
- .2 Place with long axis of each sheet transverse to steel deck ribs, with end joints staggered and fully supported on ribs.
- .3 All joints shall be taped prior to the application of vapour barrier.

- .4 Apply approved primer at a rate as specified by the material manufacturer, to all gypsum board, and fastener plate surfaces.
- .5 Primer shall be applied to all surfaces of gypsum board including Kraft Tapes at joints, fasteners and plates. Allow sufficient drying time for primer to cure prior to the installation of the vapour retarder.

### 3.4 VAPOUR/AIR BARRIER INSTALLATION

#### .1 Roofing System "R1" Only:

- .1 Install new self adhered air barrier at the roof perimeters and openings as indicated in detail drawings prior to the installation of new vapour retarder. New air barrier shall be installed over the existing deck for a minimum of 300 mm from the edge of the openings/vertical flashing surfaces.
- .2 Apply asphalt primer over the entire gypsum board areas and all exposed roof surfaces to receive bituminous material. Allow for curing of the asphalt primer as per manufacturer's recommendations. Mop apply one ply of Sopraglass 100 vapour retarder in hot bed of asphalt at the rate of 1 – 1.5 kg./m<sup>2</sup> (20 - 30 lb./sq.), over primed gypsum board surfaces.
- .3 Application of the vapour retarder shall provide a surface, free of air pockets, wrinkles, fishmouths or tears.

#### .2 Roofing System "R2" Only:

- .1 Install new self adhered air barrier at the roof perimeters and openings as indicated in detail drawings prior to the installation of new vapour retarder. New air barrier shall be installed over the existing deck for a minimum of 300 mm from the edge of the openings/vertical flashing surfaces.
- .2 Apply asphalt primer over the entire concrete deck areas and all exposed roof surfaces to receive bituminous material. Allow for curing of the asphalt primer as per manufacturer's recommendations. Mop apply one ply of Sopraglass 100 vapour retarder in hot bed of asphalt at the rate of 1 – 1.5 kg./m<sup>2</sup> (20 - 30 lb./sq.), over primed concrete deck surfaces.
- .3 Application of the vapour retarder shall provide a surface, free of air pockets, wrinkles, fishmouths or tears.

### 3.5 INSULATION PANEL INSTALLATION

- .1 Fully mop base layer of ENRGY 3<sup>®</sup> 84 mm (3.3") polyisocyanurate insulation over the new vapour retarder.
- .2 Fully mop overlay fibreboard insulation over the polyisocyanurate insulation layer. Fully mop tapered fibreboard insulation around all roof drains.



- .3 Both layers of insulation (fibreboard and polyisocyanurate) shall be fully mopped in place with close-butt joints (do not use mini-mop). The materials shall be neatly cut around all projections and perimeters.

### 3.6 BASE SHEET INSTALLATION

- .1 Base sheet membrane shall be unrolled dry on insulation panels for alignment. Each strip shall have 75 mm side laps and 150 mm end laps.
- .2 Base sheet shall be re-rolled from both ends and unrolled in a hot asphalt bed.
- .3 Asphalt shall be applied at a minimum temperature of approximately 230 degree Celsius and heated in a kettle at approximately 250 degree Celsius. Asphalt shall be applied at a rate of 1 to 1.5 kg./m<sup>2</sup> (20-30 lbs./sq.) at a distance not to exceed 1 metre from the roll to provide a sufficient thermal mass to melt and amalgamate with the asphalt of the membrane. For low temperature application, it may be necessary to heat asphalt at higher temperatures so that the application temperature is adequate. However, the heating temperature of the asphalt shall not exceed 260 degree Celsius., the recommended absolute limit.
- .4 Care must be taken that the asphalt in the kettle is continuously used to prevent distillation. Do not apply mopped membranes at temperature below 10 degree Celsius. The wind will affect proper adhesion of the bitumen.
- .5 Application shall provide a smooth surface, free of air pockets, wrinkles, fishmouths or tears.
- .6 During installation, care must be taken to avoid asphalt seepage greater than 5 mm at seams.

### 3.7 BASE SHEET (STRIPPING) FLASHING INSTALLATION

- .1 Primer coat must be dry before application of the base sheet stripping.
- .2 Base sheet stripping shall be laid in strips one metre wide to the vertical surfaces, extending on the flat surface of the roof of a minimum of 100 mm.(4") side laps shall be 75 mm and shall be staggered a minimum of 100 mm with the laps of the base sheet.
- .3 Torch protective plastic film at horizontal base before applying base sheet flashing sheet.
- .4 Mop apply base sheet flashing from top to bottom directly onto previously prepared substrate. Asphalt shall be applied at a rate of 1 to 1.5 kg./m<sup>2</sup> (20-30 lb./sq.). When possible, nail base sheet 300 mm o/c onto substrate at about 25 mm from edge.

### 3.8 CAP SHEET INSTALLATION

- .1 Once the base sheet and stripping has been applied and does not show any defects, the cap sheet can then be laid.
- .2 Cap sheet shall be unrolled starting from the low point of the roof. Cap sheet shall be re-rolled from both ends prior to torching. Care must be taken to ensure good alignment of the first roll.
- .3 Cap sheet shall be torch welded in accordance with recommendations of the membrane manufacturer, on the base sheet membrane. During this application, both surfaces shall be simultaneously melted, forming an asphalt bead that shall be pushed out in front of the cap sheet.
- .4 Care must be taken not to burn the membranes, and their respective reinforcements.
- .5 Base sheet and cap sheet seams shall be staggered a minimum of 300 mm.
- .6 Cap sheet shall have side laps of 75 mm and end laps of 150 mm surface granules on end laps shall be embedded prior to installation of following sheet.
- .7 Ensure that the two membranes are properly welded, without air pockets, wrinkles, fish-mouths or tears.
- .8 Apply asphalt primer to the surface of the modified cap sheet roof membrane at the location of the rooftop walkway pads. Torch an extra layer of modified cap sheet roof membrane to where new walkway pads are being installed.

### 3.9 CAP SHEET (STRIPPING) FLASHING INSTALLATION

- .1 Cap sheet stripping shall be laid in strips one metre wide. Side laps shall be 75 mm and shall be staggered a minimum of 100 mm from cap sheet laps.
- .2 Using a chalk line. Lay-out a straight line on the cap sheet surface, perpendicular to the roof edge.
- .3 Using a torch and round nose roofing trowel to embed the surface granules into the heated and soft bitumen, from the chalk line to the edge of the cap sheet, at the top of the cant.
- .4 Cap sheet stripping shall be torch welded directly on its base sheet, proceeding from bottom to top. Torching shall soften the two membranes and ensure a uniform weld.
- .5 Cap sheet stripping shall be applied to extend down outside face of exterior edge, across top of parapet, down interior vertical surface and on to flat roof a distance of 150 mm, to the extent of area of embedded granules. Cut roll into required lengths and use width of roll (1 metre) down length of roof, maintaining specified 75 mm side laps.

### **3.10 STACKS, DRAINS & SCUPPERS**

- .1 Remove existing and install new insulated aluminum vent stacks. Install new insulated spun aluminum vent stacks. Ensure that all new removable aluminum caps are pinned to the body of the stacks.
- .2 Remove existing and install new drain inserts and scuppers. Install new drain inserts and U-Flow and control flow devices for all new drains. Ensure that all new U-Flow seals are tight and in place.
- .3 Install new electrical, mechanical and gas line stack flashings.

### **3.11 PITCH POCKET INSTALLATION:**

- .1 Make sure substrate is clear of loose granules, or all foreign substances that can affect adhesion.
- .2 Place prefabricated curbs in the desired location and mark the outside edge for reference. Curbs should be placed to assure at least 25 mm clearance from the inside of the curb penetration.
- .3 Penetrations should be prepared by wire brushing to remove loose cements, sealers, rust, or other contaminants that would prevent a positive seal.
- .4 Seal base of penetration with specified sealant to prevent the potential of the specified mastic flowing through openings.
- .5 Apply a liberal bead of sealant to the substrate where curb will be placed.
- .6 Apply a liberal bead of sealant to the locking joint of the curb.
- .7 Set prefabricated curb in place and apply equal pressure to assure positive contact with the roof membrane. Strike away excess sealant.
- .8 Dispense an initial amount of mastic to ensure a proper mix and fill inside of prefabricated curb until full.

### **3.12 CLEANING & REMOVAL OF RUBBISH**

- .1 Clean all roof/work areas and grounds around building at the end of each working day. Remove all construction debris from site on daily basis and as frequently as required to keep site clean at all times.
- .2 Provide and keep during the duration of the contract a garbage bin on site. Location to be approved by the Engineer and the Owner's representative. Empty bin as frequently as required to avoid spillage of debris.
- .3 Immediately remove all garbage and debris from site upon completion of the project.

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- .4 Contractor will be held responsible for repairs to any elements if damaged during the construction project period. Repairs shall take place immediately to the satisfaction of the Owner.
- .5 Prior to demobilization from the site, the work shall be reviewed by the Owner's, Engineer and the Contractor. All outstanding work, defects and deficiencies noted and non-compliances with these specifications or the recommendations of material manufacturer shall be corrected immediately.

### 3.13 OTHERS

- .1 Disconnect and re-connect all rooftop units, (including all connections such as: gas, electrical, etc.) as required to ensure proper installation of roofing, flashing and metal work. Work shall be carried out by approved qualified contractors. Allow for lifting of the rooftop mechanical units for the installation of new curbs and new flashing systems, on all roof levels. It is expected that all roof accessories (i.e. tall cones, rain collars, drains, aluminum vent stacks, electrical/mechanical/gas line stacks, etc...) will be replaced with new.
- .2 Supply and install new wood supports over one (1) inch extruded polystyrene insulation for gas pipes and electrical conduits, complete with stainless steel clamps. Supports shall be at an interval of 2.4 m (8 ft).
- .3 It is expected that all roof accessories (i.e. tall cons, rain collars, etc...) will be replaced.
- .4 Clean all debris from all roof surfaces, on all buildings and on the grounds.

**End of Section 07 52 00**

## **PART 1 - GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 All work of this Section to conform to the appropriate requirements of the most recent edition of the Ontario Building Code.
- .2 Coordinate work of the Section, and with other related sections, to ensure satisfactory and expeditious completion of the Work.
- .3 Review and update all work schedules with Engineer on a regular basis.
- .4 Examine the Work of this, and all related sections, to confirm the extent, location, quality, and condition prior to commencing.
- .5 Discontinue work during severe rain, wind, heat, cold, or other such inclement weather and monitor time lost in relation to Environment Canada daily norms. Lost time will only be considered where actual conditions exceed norms.

### **1.2 SUMMARY**

- .1 Furnish all labour, materials, equipment and services necessary to perform the Work of this Section as specified.
- .2 Protect and repair as necessary, all materials adjacent to, or affected by this Work.
- .3 Install new metal copings and counter flashings, as indicated and directed, and shown on detail drawings.

### **1.3 SUBMITTALS**

- .1 Submit shop drawings in accordance with Section 01300.
- .2 Submit duplicate 50 mm x 50 mm samples, for review by Engineer and approval by Owner, of each type of sheet metal material, colour and finish.
- .3 Before work commences, verify in writing that materials submitted and approved are mutually compatible and are compatible with existing materials. Support verification with manufacturers(s) data and/or certification.
- .4 If a material submitted and approved is not suitable for verification and/or certification, submit alternate material for verification and certification for review by Engineer and approval by Owner.
- .5 Upon request, submit Material Safety Data Sheets.

## 1.4 REFERENCES

- |                  |  |
|------------------|--|
| ASTM A525M-87    | - Specification for General Requirements for Steel Sheet, Zinc coated. (Galvanized) by Hot-Dip Process |
| ASTM B117-90     | - Test Method of Salt Spray (Fog) Testing  |
| CAN/CAS-S136-M89 | - Cold Formed Steel Structural Members   |
| CGSB-1-GP-108    | - Bituminous Paint   |
| CRCA             | - Canadian Roofing Contractors' Association Roofing Specification Manual                               |

## 1.5 QUALITY ASSURANCE

- .1 Perform work of this Section by competent workers skilled and experienced in using the specified materials.
- .2 Execute work of this Section under the continuous supervision and direction of a competent person specializing in the type of work specified.
- .3 Arrange, and make allowance for all inspections and test considered necessary by the Engineer. The Engineer and/or his designated representative as approved by the Owner may conduct inspections and tests.

## 1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- .1 Deliver all materials in original, unopened packaging with the manufacturer's label(s) intact.
- .2 Store and protect all materials from precipitation, ground moisture and temperature extremes by use of weatherproof coverings and raised platforms.
- .3 Follow precautionary statements on product labels for storage and handling before use and make reference to applicable Material Safety Data Sheets.
- .4 Obtain Owner's approval of the location and extent of all on-site storage areas.
- .5 Pallets of materials shall not be double stacked.
- .6 Protect metal during handling and storage to prevent rusting, staining, abrasion of finish coatings, bending and denting.
- .7 Take all necessary precautions to protect pre-finished metal surfaces against scratching.

## 1.7 JOB SITE CONDITIONS

- .1 Prior to reinstallation of metal flashings, inspect those areas to receive the metal flashing to ensure that they are clean, dry, sound, smooth and continuous.

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- .2 Do not apply work during rain, fog or snow. Do not work over damp, frozen or unsuitable surfaces.
- .3 Commencement of Work is acceptance of the surfaces and conditions and assumes full responsibility for finished condition of the Work.

## 1.8 WARRANTY

- .1 The work described in this Section shall be guaranteed against all defects in materials and workmanship for a three (3) year period from the date of Substantial Performance of the Work.
- .2 Submit each warranty:
  - .1 identifying the party as warrantor/guarantor.
  - .2 Issued in both the Contractor's and Owner's names.
  - .3 Including labour and materials for removal, repair and/or replacement of products provided as part of the Work and adjacent damaged materials.
- .3 The warranty shall cover the replacement or repair of the Work of this Section resulting from faulty materials and/or workmanship.
- .4 Promptly correct, at no expense to the Owner, any defects or deficiencies that become apparent within the warranty period.

## **PART 2 - PRODUCTS**

### 2.1 MATERIALS

- .1 METAL FLASHINGS: 24 Ga. thickness or as otherwise shown, commercial quality, prefinished galvanized metal as approved. Apply 8000 Series coating to dry film on surfaces exposed to view. Owner will select color and gloss from manufacturer's 12 Industry Standard Colours.
- .2 PREFINISHED SHEET STEEL: 24 Ga. thickness or as other wise shown, commercial quality, prefinished galvanized metal as approved, to closely match existing metal work. Apply 8000 Series coating to dry film on surfaces exposed to view. Colour and gloss will be selected by Owner from manufacturer's 12 Industry Standard Colours.
- .3 SPLICE COVERS: of same material and temper as prefinished sheet steel, minimum 50 mm wide and 22 Ga. minimum thickness.
- .4 CLEATS AND EDGE STRIPS: Of same material and temper as prefinished sheet metal, minimum 50 mm wide and 18 GA. minimum thickness.

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- .5 ANCHORS: Stainless steel.
- .6 FASTENERS: Stainless steel, head colour same as exterior sheet if exposed. Screw type only.
- .7 SOLVENT: "MEK", Methyl Ethyl Ketone solvent to clean surfaces, or approved alternate.
- .8 BITUMINOUS PAINT: Alkali resistant isolation coating, conforming to CGS 1 GP-108.
- .9 TOUCH-UP PAINT: As recommended by coating manufacturer.
- .10 METAL DRIP FLASHING: As specified in Section 04200.
- .11 SEALANTS: As specified in Section 07 90 00.
- .12 MISCELLANEOUS: Provide all appropriate incidental materials required to properly finish the Work specified, as implied by Paragraph 1.2 of this Section.

### **PART 3 - EXECUTION**

#### **3.1 PREPARATION**

- .1 Subsequent to installation of new waterproofing materials, install metal counter flashings along base of the existing above grade walls.
- .2 Ensure that waterproofing is fully cured prior to installation of new flashing materials.

#### **3.2 SHOP FABRICATION**

- .1 Fabricate metal flashings and other sheet metal work in accordance with applicable CRCA >FL' series specifications.
- .2 Form flashings to closely match profiles shown on drawings.
- .3 Brake form pieces in maximum lengths suitable for the Work. Make allowances for expansion at joints. Cut, drill and shape in shop where possible.
- .4 Hem exposed edges on underside 12 mm minimum. Mitre and seal corners with sealant, in sliplock flashing to allow for thermal expansion.
- .5 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
- .6 Form bends with straight sharp lines, angles and arises; and form sheets into true planes free from twists, buckles, dents and other visual distortions.



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- .7 Apply isolation coating to metal surfaces in contact with concrete, mortar, or dissimilar metals.

### 3.3 FLASHING INSTALLATION

- .1 Install metal flashing with concealed fasteners free from distortion and other defects detrimental to appearance or performance as shown and directed on detail drawings.
- .2 Install metal flashing with uniform wash to exterior, level in length or uniform in slope, straight in alignment with plumb upstands or faces.
- .3 Flashing shall be anchored to backup wall with corrosion resistant fasteners, plumb and level, free of warp or twist.
- .4 Flashing shall be firmly secured by means of "S" lock cleats at seams and joints, with adequate provision for expansion and contraction.
- .5 Cover joints in horizontal flashings with matching splice covers to Engineer's approval.
- .6 Fasten splice covers with self-tapping stainless screw fasteners.
- .7 Install vertical metal trim shingle-style with minimum overlap of 50 mm.
- .8 Metal fasteners shall be compatible with metal flashings.
- .9 Heads of fasteners shall be concealed wherever possible, or other wise shall be same colour as finished flashing.
- .10 Double-back exposed edges of metal flashing at least 12 mm.
- .11 Protect dissimilar metal materials from electrolytic action and from contact with concrete materials with a heavy coating of bituminous paint.

### 3.4 CLEAN UP

- .1 At the completion of the work **each day** remove all debris, garbage and excess materials from the site.
- .2 Storage of debris will not be allowed overnight.
- .3 Upon completion of the work, clean up all debris, excess materials and equipment and remove from site.
- .4 All drippage or spills of sealants or primers shall be cleaned to approval of Engineer.

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- .5 Wash down all metal surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

**End of section 07 62 00**

## **PART 1 - GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 All materials shall be new and in perfect condition, free from defects that may impair strength, performance, durability or appearance.
- .2 Work shall be executed to the highest standards of workmanship in the industry, by fully trained applicators in strict accordance with the printed directions of the sealant manufacturer.
- .3 Review and update all work schedules with Engineer on a regular basis.
- .4 Examine the Work of this, and all related Sections to confirm the extent, location, quality, and condition prior to commencing.
- .5 Discontinue work during severe rain, wind, heat, cold, or other such inclement weather and monitor time lost in relation to Environment Canada daily norms. Lost time will only be considered where actual conditions exceed norms.

### **1.2 SCOPE OF WORK**

- .1 Work Included:
  - .1 Furnish all labour, materials, equipment and services necessary for the application of sealants as required to complete all that is required during all replacement and repair phases.
  - .2 Clean and prepare all surfaces, and prime all substrate materials to a condition acceptable for the installation of the sealant materials.
  - .3 Make good any materials affected by sealant installation procedures, or affected by sealant materials.
  - .4 The removal and replacement of all exterior sealants around windows, doors, air louvers, utility boxes and all other wall projections.
  - .5 The removal and replacement of all vertical wall joints as indicated on drawings.

### **1.3 SUBMITTALS**

- .1 Before commencement of work, and before any materials are delivered to job site, submit to Engineer a complete list of materials proposed for use in the Work, including identification of manufacturer and product names. Certify that, where applicable, materials meet relevant CGSB standards. Provide any certificates requested.

- .2 Submit to Engineer all appropriate technical and product data, including written application recommendations from the manufacturer. Provide written confirmation from the manufacturer as to the compatibility of all materials to be used.
- .3 Upon request, submit appropriately sized samples of each type of material and colour to be used to Engineer for approval.
- .4 Cure samples under conditions anticipated at job site during application.
- .5 Submit from manufacturer a copy of all field test results required in Subsection 1.5 of this Section.

#### **1.4 REFERENCE STANDARDS**

- .1 Reference Standards outline in this Section include:
  - .1 CAN/CGSB-19.13-M87 Sealing Compound, One-component, Elastomeric, Chemical Curing.
  - .2 CAN/CGSB-19.18-M87 Sealing Compound, One-component, Silicone Base, Solvent Curing.
  - .3 CAN/CGSB-19.24-M90 Multi-component, Chemical Curing Sealing Compound.
  - .4 CGSB-19.0-M77, Methods of testing putty, caulking and sealing compounds.
  - .5 CGSB 19-GP-5M-76 Sealing Compound, One Component Acrylic Base, Solvent Curing.
  - .6 CAN/CGSB-19.13-M87 Sealing Compound, One component, Elastomeric, Chemical Curing.
  - .7 CGSB 19-GP-14M Sealing Compound, One Component, Butyl-polyisobutylene Polymer Base, Solvent Curing.
  - .8 CAN/CGSB-19.17-M90 One-Component Acrylic Emulsion Base Sealing Compound.
- .2 Identify any revisions to the referenced standards and notify Engineer of same.
- .3 Conform to most stringent requirements of referenced standard or revision.

#### **1.5 QUALITY ASSURANCE**

- .1 All sealant materials and accessories shall be applied by a contractor approved by the manufacturer. Provide written evidence of approval from manufacturer prior to commencement of the work, on request.
- .2 Applicators shall have a minimum five (5) years proven experience in all phases of caulking work specified herein. Submit verification of experience on request.
- .3 Employ only fully trained and skilled workers and execute work in strict accordance with sealant manufacturer's printed instructions.

- .4 All materials shall be new and in perfect condition, free from defects that may impair strength, performance, durability or appearance.
- .5 Work shall be executed to the highest standards of workmanship in the industry, by fully trained applicators in strict accordance with the printed directions of the sealant manufacturer.
- .6 Arrange for sealant manufacturer's technical representative to attend site meeting with Contractor and Engineer prior to the commencement of any caulking work to discuss the following:
  - .1 Analysis of job and weather conditions.
  - .2 Anticipated frequency of joint movement.
  - .3 Shape factor of various joints.
  - .4 Correct size and profile of joint for sealant to be used.
  - .5 Recommendations for priming joints.
  - .6 Number of beads of caulking to be provided.
  - .7 Inspection of surfaces and joints
  - .8 Recommendations for sealant installation
  - .9 Field adhesion testing and mock-up; and
  - .10 Aesthetic concerns.
- .7 At not extra cost, arrange for the sealant manufacturer(s) to conduct all field tests required to ascertain that full bond between sealant and substrate materials is attainable and that primers, sealants and other coatings are mutually compatible. The manufacturer shall provide written copies of such tests when requested and/or deemed necessary.

## **1.6 PRODUCT DELIVERY, STORAGE AND HANDLING**

- .1 Deliver all materials in original, unopened packaging with the manufacturer's labels intact.
- .2 Store all materials in such a manner so as to protect them from precipitation, ground moisture, temperature extremes, sunlight and construction activities by use of weatherproof coverings and raised platforms. Interior storage shall be employed when and where necessary, with the express written consent of the Owner.
- .3 Pallets of materials shall not be double stacked.
- .4 Protect materials from freezing. Materials suspected of having been subjected to freezing are not to be used unless the manufacturer verifies, in writing, that the material has not been damaged.
- .5 Remove and replace any damaged, wet or broken materials.
- .6 Store materials away from open flame or ignition sources.

- .7 Do not transport any materials through the building without the written consent of the Owner.
- .8 Follow precautionary statements on product labels for storage and handling before use and make reference to applicable Material Safety Data Sheets.

## **1.7 JOB SITE CONDITIONS**

- .1 Apply sealant materials at ambient temperatures, relative humidity, and weather conditions satisfactory to manufacturer(s) and in any case under dry conditions only.
- .2 Do not apply sealants during inclement weather conditions.
- .3 Do not apply any sealant at ambient temperatures below 5 C without obtaining manufacturer's written recommendations for review and approval by Engineer.
- .4 Prior to installation, inspect areas to receive sealant material to ensure that they are clean, dry, sound, smooth and free from dust, dirt, laitance, frost and other deleterious matter.

## **1.8 ENVIRONMENTAL AND SAFETY REQUIREMENTS**

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labeling and provision of material safety data sheets acceptable to Labour Canada.
- .2 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.
- .3 Arrange for the building staff to operate ventilation systems on maximum outdoor air and exhaust during interior installation of caulking and sealants. Ventilate area of work as required by use of approved portable supply and exhaust fans.

## **1.9 WARRANTY**

- .1 The work described in this Section shall be guaranteed against all defects and deficiencies in materials and workmanship for a five (5) year period from the date of Substantial Performance of the Work.
- .2 Defects include, but are not limited to, sag, air pockets, wrinkles, ridges, embedded foreign materials, failure in adhesion or cohesion, air and moisture leakage, staining of adjacent materials, cracking, crumbling, melting, shrinkage, running, bubbling, or change of colour.

- .3 Submit each warranty:
  - .1 identifying the party as warrantor/guarantor
  - .2 issued in both the Contractor's and Owner's names
  - .3 including labour and materials for removal, repair and/or replacement of products provided as part of the Work.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- .1 In the context of this Specification, the terms Acaulking compound@ and Asealant@ are deemed the same.
- .2 Primers: As recommended by sealant manufacturer(s) to ensure superior adhesion and prevent staining of adjacent materials.
- .3 Cleaning Materials: Ethyl alcohol, ketone solvent, xylol, toluol, or methyl-ethyl-ketone (MEK), as supplied or recommended by sealant manufacturer(s) and compatible with all adjacent materials.
- .4 Masking Tape: As supplied or recommended by sealant manufacturer(s) and compatible with all adjacent materials.
- .5 Bond Breaker Tape: Pressure sensitive plastic tape, which will not bond to sealants, as supplied or recommended by the sealant manufacturer.
- .6 Joint Backing Material (Backer Rod): Polyethylene or polyurethane foam rope, as recommended by sealant manufacturer(s). Circular cross section diameter 25% greater than join width at time of installation, compatible for use with sealant.
- .7 Colours: Selected by Engineer from manufacturer's standard range of colours to closely match existing materials and to Owner's approval.
- .8 Exterior Joint Sealant: Dymonic@ by Tremco Ltd., or approved alternate, high-performance, polyurethane based component, chemical curing sealant, complying with AN/CGSB-19.24-M90.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- .1 Examine all existing surfaces and substrates upon which work of this Section is dependent. Report to the Engineer in wiring defects or discrepancies. Commencement of work implies acceptance of existing conditions and assuming full responsibility for finished condition of the Work.

- .2 Before commencement of work, verify acceptability of existing site conditions with sealant manufacturer's representative with to joint size, depth and condition of substrate; that all joints can be sealed as specified in an acceptable manner and that the execution, performance and quality of work will not be adversely affected by any existing conditions.

### **3.2 PREPARATION OF SURFACES**

- .1 Protect adjacent surfaces from damage. Use planks, plywood, drop sheets and other forms of protection as required.
- .2 Remove all existing sealants including all residual sealant materials by suitable methods to prevent damage to adjacent surfaces. Care must be taken to ensure no damage or visible change takes place to the surface of the substrate that will not be covered by the replacement sealant materials.
- .3 Remove existing paint coating materials in conjunction with removal of existing sealants to permit application of new caulking directly to concrete substrate.
- .4 Clean joints of all contaminants and impurities by abrading with a wire brush, grinding, saw cutting, or as otherwise required to permit application of new caulking.
- .5 Where routing out of concrete is required to achieve correct joint configuration along cracks greater than 1/16" in width carry out work to approval of Engineer prior to application of sealant.
- .6 Routing out of concrete surfaces is included in the price and will not be measured separately for payment.
- .7 Clean surfaces of all joints and spaces that are to be sealed in an approved manner. Ensure that surfaces are sound, dry and of dust, grease, oil, oxidation, other contaminants, laitance or loose and/or foreign materials which may adversely affect the adhesion of the sealant. Clean metals of oxides, mill and foreign materials by wire brushing, grinding or sanding.
- .8 Wipe metal surfaces to be sealed, except pre-coated metals, with cellulose sponges or clean rags soaked with cleaning material and wipe dry with clean cloth. Where joints are to be sealed with silicone based sealants clean joint with methyl-ethyl-ketone (MEK) only. Clean pre-coated materials with solutions or compounds that will not injure finish and which are compatible with joint primer and sealant. Check that ferrous metal surfaces are painted before applying sealant. Ensure that solvents do not damage adjacent painted/coated surfaces.
- .9 Ensure that all materials in contact with sealant are compatible.
- .10 Where required, mask adjacent surfaces prior to priming and application of caulking to prevent staining and/or contamination of terrace surfaces intended for application of waterproofing.



- .11 Prime inner face surfaces of the joint in accordance with sealant manufacturer's recommendations, to provide full adhesion and to prevent staining of adjacent exposed surfaces, immediately prior to caulking.
- .12 Examine joint sizes and correct to achieve prior width/depth ratio as per sealant manufacturer's requirements.
- .13 Install joint backing materials to achieve correct joint for proper width and depth ratio of sealant.
- .14 Ensure backer rod is not punctured during installation.
- .15 Install backer rod with a blunt instrument to ensure that rod is not punctured during installation. Remove and replace any punctured rod immediately.
- .16 Test substrate for adhesion.

### **3.3 APPLICATION**

- .1 Apply all sealants, primers, joint backing, bond breakers to manufacturer's printed instructions.
- .2 Primer selection shall be in accordance with manufacturer's written recommendations. Primer shall be applied with a clean, dry, lint-free cloth. Flooding of the surface with primer should be avoided.
- .3 Conform to manufacturer's printed directions for materials requiring site mixing, heating, or special handling. Consult with manufacturer to determine requirements for application of sealant when ambient temperature of substrate is below 5 Degree Celsius.
- .4 Do not use sealants that have been stored for a period of time exceeding the maximum recommended shelf-life.
- .5 Caulk joints in surfaces to be field painted before surfaces are painted. Where surfaces to be caulked are shop primed or are already field primed, check to ensure prime paint or existing paint and sealant are compatible.
- .6 Apply sealant under pressure using proper tools and techniques to ensure the required full depth penetration and proper adhesion to substrate. Superficial pointing with skin bead is not acceptable.
- 7 Apply sealants in continuous beads. A minimum sealant substrate bond of at least 6 mm must be achieved.
- .8 Use sufficient gun pressure to completely and uniformly fill joints and voids to proper depth.

- .9 Do not block or impede any drain holes. Ensure any existing drain holes remain unobstructed. Open up existing drain holes where required.
- .10 Form surface of sealant with full bead, smooth, and free from ridges, wrinkles, sags, air pockets, and embedded impurities. Neatly too surface to a slight concave joint.
- .11 There shall be no air voids throughout the entire joint cross section.
- .12 Immediately remove excess sealant materials or droppings in a n approved manner from adjacent finished surfaces, as work progresses. Do not use scrapers, chemicals, or other tools that could damage finished surfaces.
- .13 Ensure that methods of protection do not interfere with proper sealant curing. Consult with manufacturer(s) for appropriate curing methods and times.
- .14 Remove masking materials immediately after joints have been sealed and tooled.
- .15 Make good other work damaged by work of this Section.

### **3.4 CLEAN UP**

- .1 At the completion of the work each day remove all debris, garbage and excess materials from the site. Storage of debris will not be allowed overnight.
- .2 Upon completion of the work, clean up all debris, excess materials, and equipment and remove from site.
- .3 All drippage or spillage of sealants or primers shall be cleaned to approval of Engineer.

**End of section 07 90 00**

**PART 1 - GENERAL****1.1 GENERAL**

- .1 Provide all materials and labour necessary to install two base coats of Rust-Oleum Mathys Noxyde™ / Acrylic Enamel in strict accordance with project drawings, specifications and current Rust-Oleum Corporation application instructions. Provide all material and labour necessary to install one finish coat of ICI Weatherguard on all slope metal roof section C.

**1.2 RELATED WORK BY OTHER**

- .1 Division 7 Thermal & Moisture Protection

**1.3 SYSTEM DESCRIPTION**

- .1 The Mathys Noxyde is a system consisting of a high build water based acrylic elastomeric for interior and exterior use.

**1.4 ENGINEERING AND DESIGN REQUIREMENTS**

- .1 The Design Architect and Project Engineer shall be responsible for all decisions pertaining to design, detail, and structural capability
- .2 Equivalent materials of other manufacturers may be substituted on approval of Roof Consultant. These requests for substitution shall include manufacturer's literature for each product giving the name, resin type, descriptive information, volume solids, and recommended dry film thickness (DFT). A list of a minimum of ten (10) projects where the coating system has been applied and performed to expectations for at least three (3) years service is also required. No requests for substitution shall be considered with lower system film thickness, number of coats and/or change the resin type of the specified coating.

**1.5 SURFACE PREPARATION AND APPLICATION DESCRIPTION**

- .1 Substrate cleaning, surface preparation, coating application and dry film thickness shall be as specified and shall meet or exceed Noxyde technical data sheet recommendations.
- .2 All application equipment shall be clean and maintained in proper working order in accordance with the equipment manufacturers' recommendations.
- .3 The Mathys Noxyde / Acrylic topcoat shall be applied in accordance with the air and surface temperature limits and work areas shall be reasonably free of airborne dust during application and drying time.

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**1.6 PERFORMANCE REQUIREMENTS**

- .1 Roofing Contractor shall retain an approved and independent NACE Certified Coating Inspection and Testing company to visit the site during the application of new metal roof coating system. The cost of such testing will be paid from allocated testing allowance as per owner's authorization.

**1.7 QUALITY ASSURANCE**

- .1 Applicator Qualifications:
  - .1 Applicator shall be knowledgeable in the proper installation of the Mathys Noxyde /Acrylic Enamel and experienced in the application of water based elastomerics and acrylic enamel coatings.
  - .2 Applicator shall provide a minimum of one (1) year workmanship warranty for the application of the Mathys Noxyde / Acrylic Enamel.

**1.8 SUBMITTALS & MOCKUP**

- .1 All Mathys Noxyde / Acrylic Enamel's Product Data Sheets, application and related equipment information.
- .2 Color Cards: Supply color cards of specified materials showing range of colors.
- .3 Applicator: Provide certified contractor documentation showing proof of familiarity with the Mathys Noxyde / Acrylic Enamel.
- .4 Provide three mockup areas of 5m x 5m finished product on the surface of the roof prior for Engineer's and Owner's review and approval at scattered areas of the roof.

**1.9 DELIVERY STORAGE AND HANDLING**

- .1 Deliver the Mathys Noxyde / Acrylic Enamel on-site in labeled, original, unopened containers.
- .2 All materials shall be stored inside or under cover at ambient temperature. Keep materials dry, protected from elemental damage, and protect from freezing.

**1.10 PROJECT CONDITIONS**

- .1 Protect adjacent work from damage and overspray during application of the Mathys Noxyde / Acrylic Enamel.

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**1.11 WARRANTY**

- .1 The technical data and suggestions of use are correct to the best of our knowledge, and offered in good faith. The statements of this specification do not constitute a warranty, expressed, or implied, as to the performance of these products. As conditions and use of our materials are beyond our control, we can guarantee these products only to conform to our standards of quality, and our liability, if any, will be limited to replacement of defective materials. All technical information is subject to change without notice.
- .2 Provide standard written project warranties from Rust-Oleum Corporation Technical and Legal Departments.

**PART 2 - PRODUCTS****2.1 MANUFACTURER**

- .1 The Mathys Noxyde / Acrylic Enamel shall be obtained from through ICI Devoe or Rust-Oleum Corporation.

**2.2 MATERIALS**

- .1 The Mathys Noxyde is a single component water based acrylic elastomeric available in a selection of standard color finishes.
- .2 The ICI Devoe Weathergard Acrylic Enamel is a water based acrylic consisting of selection of colors in order to match the colour of new coating to the colour of the existing building exterior door and window frames.

**PART 3 - EXECUTION****3.1 SURFACE PREPARATION**

- .1 All cleaning and surface preparations specified are minimums.
- .2 Individually check and tighten every fastener on all roof surfaces. Replace any fastener that will not tighten with oversize fasteners (fastener type to match existing). Supply and install additional fasteners as necessary on loose, warped, lifting or dubious areas (fastener type to match existing). Reinforce and seal any leaking or known areas of concern by use of fabric mesh embedded in Noxyde coating.

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- .3 All surfaces to be coated shall be free of cracks, pits, fins, projections, or other imperfections that would interfere with the formation of a uniform, unbroken coating film. The Coating Contractor is to examine the substrate to determine if it is in satisfactory condition to receive the Mathys Noxyde. Obtain Coating Contractor's written report listing conditions detrimental to performance of work in this specification. Do not proceed with the application of the Mathys Noxyde until unsatisfactory conditions have been corrected.
- .4 Power wash all roofs with biodegradable degreasers using minimum 3500 PSI needle spin jet power wash on all surfaces to be painted to remove any loose rust, failing paint, surface contamination, dirt, oil, grease, and chalking. Substrate will be clean, firm and paint ready as per SSPC SP 2 and SSPC SP 3 specifications. This is prior to any mechanical cleaning that may be required.
- .5 Surfaces of welds shall be scraped and ground as necessary to remove all slag and weld spatter.
- .6 At minimal, all steel surface shall be clean in accordance to SSPC-SP-3 Power Tool Cleaning.
- .7 Previously coated surfaces shall be repaired to be relatively free of surface imperfections. A check for loosely held, delaminating coating shall be performed as per ASTM 3359. The gloss shall be dulled by mechanical means to promote proper adhesion of the Mathys Noxyde / Acrylic Enamel. All previous coatings damaged by welding shall be completely removed.
- .8 Satisfactory inspection by the Owner, General Contractor, Project Engineer, at any point in the coating process does not relieve the contractor of ownership and responsibility with regard to application long term service life.

### 3.2 MIXING AND THINNING

#### .1 MIXING

- .1 Noxyde requires thorough power mixing.

#### .2 THINNING

- .1 Normally not required. Thin 20% with clean fresh water only when using as a prime coat on existing coatings or over smooth concrete or metal surfaces.

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- .2 ICI Weathergaud Finish:
  - .1 Thinning, when necessary, shall be done with clean, ambient temperature clean, fresh water.
  - .2 Thinning is not required for brush, roll application.
  - .3 Thinning is not normally required for air atomized or HVLP spray.
  - .4 Thin the Industrial Acrylic Enamel up to 6% by volume for airless spray application.

### 3.3 APPLICATION

- .1 Weather Conditions:
  - .1 Apply Mathys Noxyde only when air and surface temperatures are between 46-130° F (8-55° C), the relative humidity is no greater than 85%, and surface temperature is at least 5° F (3° C) above the dew point.
  - .2 Apply Acrylic Enamel only when air and surface temperatures are between 35-100° F (2-38° C), the relative humidity is no greater than 95%, and surface temperature is at least 5° F (3° C) above the dew point.
  - .3 The Acrylic Enamel shall not be applied, except under shelter, during wet, damp, foggy, or windy weather.
- .2 Coating Application:
  - .1 All coating work is to be performed as per manufacturer's current technical data sheet(s) and SSPC good painting practices. The coating to be used is Rustoleum's Noxyde – a rust inhibitive waterbased elastomeric. Noxyde, Rustoleum and ICI by Akzo Nobel.
  - .2 Apply only to a clean and dry surface.
  - .3 Pre-seal all fasteners and all seams with a heavy coat of Noxyde elastomeric coating (apply by brush roller or spray).
  - .4 Apply Noxyde by air spray to the recommended film thickness per coat. Two (2) coats at 7 mils dry film thickness are required.

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- .5 If the surface is previously coated, then a tack coat (1• mils dft) of Noxyde, thinned 20% with fresh water, shall be applied to maximize adhesion to the previous coating. This is done prior to the two full coat applications.
- .6 Noxyde can be recoated with itself after four hours if the relative humidity is less than 70%. Allow Noxyde 16 hours of cure time before applying the acrylic finish.
- .7 Use brown Noxyde (note: Noxyde may NOT be tinted, it is a factory mix only).
- .8 Apply a final top coat of ICI Weatherguard exterior grade low gloss satin finish acrylic, colour to be matched to existing new brown corrugated metal as approved by the Roofing Consultant and Owner prior to application. The final coat must be uniform in colour, appearance and sheen.
- .9 If the application of the finish coat is delayed for any period of time which allows surface contamination to collect on the primer, then the surface shall be cleaned prior to application of the Acrylic Enamel finish.
- .10 Sags, checks, blisters, skips, teardrops, or rolled edges shall not be accepted and shall be completely removed and recoated.
- .11 Ensure all roof surfaces are properly dry – and verify that there is no moisture trapped under loose edges or seams before applying any coating.
- .12 Allow for the replacement of all caulking around the perimeter of all slope metal roofs and at counter flashings. Allow for the replacement of any damaged metal flashings along, walls, valleys and eaves prior to the application of new coating system.
- .3 Mandatory Requirements for Coating Application:
  - .1 Use of wet film gauges throughout the application process of the Noxyde is mandatory to ensure proper film thickness.
  - .2 The existing film thickness on the roof is known and will be taken into account. Note that the specifications require 14 mils DFT of Noxyde above the existing coating. The work will be inspected by a NACE Certified Coating Inspector throughout the project and there will be mandatory hold points at each critical step.
  - .3 Preparation, bolt tightening/replacement, section reinforcement with embedded mesh, bolt and seam sealing, first coat, second coat, final coat.



.4 Protection of Surfaces:

.1 The Coating Contractor shall be responsible for protecting all nearby items, building elements and adjacent neighbouring properties against spills, drips, overspray or any other form of coating damage.

.2 The Coating Contractor and its subcontractors shall be responsible for removing spots or repairing damaged surfaces to the satisfaction of the Roof Consultant and Owner.

.5 Clean-up shall be done using xylene or MEK.

.6 Inspection:

.1 The work shall be subject to third party independent NACE Certified Coating Inspection, minimally at the specified hold points.

.2 Work may not proceed until approved, in writing, by the inspector, at each stage.

.3 Any work not meeting the specifications shall be remedied prior to proceeding.

.4 Hold points shall be minimally.

.5 Once the roof is prepped to verify cleanliness.

.6 All fasteners are tightened.

.7 All fasteners are initially coated/sealed with Noxyde

.8 All seams or patchwork has been addressed as specified.

.9 After the first coat of Noxyde.

.10 After the second coat of Noxyde. (DFT of the Noxyde will be minimally 14 mils, measured as per SSPC PA 2)

.11 After the third coat. (Finish coating shall be uniform in color and appearance, no dry spray lines visible.)

**End of section 09 97 13**

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**PART 1    GENERAL****1.1    ADMINISTRATIVE REQUIREMENTS**

- .1    Review available information and reports, including designated substances and hazardous materials, and take protective precautions.
- .2    Should material resembling designated substances or hazardous materials be encountered, stop work, take preventative measures, and notify Engineer immediately.
- .3    Do not proceed until written instructions have been received from Engineer.
- .4    Notify Engineer before disrupting access or services.

**1.2    SUBMITTALS FOR INFORMATION**

- .1    Prior to beginning of work, submit detailed Waste Reduction Workplan and indicate:
  - .1    Descriptions of and anticipated quantities, in percentages, of materials to be salvaged reused, recycled and landfilled.
  - .2    Schedule of selective demolition.
  - .3    Number and location of dumpsters.
  - .4    Anticipated frequency of tippage.
  - .5    Name and address of haulers, waste facilities, and waste receiving organizations.

**1.3    SUBMITTALS FOR CLOSEOUT**

- .1    Certificates
  - .1    Letter stating removed materials has been properly disposed of.

**PART 2    PRODUCTS****2.1    NOT USED**

- .1    Not used.

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**PART 3     EXECUTION****3.1     EXAMINATION**

- .1     Verification of Conditions
- .2     Evaluation and Assessment

**3.2     PREPARATION**

- .1     Inspect building and site and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage and items to remain.
- .2     Locate and protect utilities. Preserve active utilities traversing site in operating condition.
- .3     Notify and obtain approval of utility companies before starting demolition.
- .4     Disconnect, cap, plug or divert, as required, existing public utilities within the property where they interfere with the execution of Work, in conformity with the requirements of the authorities having jurisdiction. Mark the location of these and previously capped or plugged services on the site and indicate location (horizontal and vertical) on the record drawings. Support, shore up and maintain pipes and conduits encountered.
- .5     Immediately notify Engineer and utility company concerned in case of damage to any utility or service, designated to remain in place.
- .6     Immediately notify Engineer should uncharted utility or service be encountered, and await instruction in writing regarding action.

**3.3     PROTECTION**

- .1     Prevent movement, settlement, or damage to adjacent structures, utilities, and landscaping features. Provide bracing and shoring as required.
- .2     Keep noise, dust, and inconvenience to occupants to minimum.
- .3     Protect building systems, services and equipment.
- .4     Provide temporary dust screens, covers, railings, supports and other protection as required.

**3.4     SALVAGE**

- .1     Remove items to be reused or salvaged as indicated.
- .2     Store as directed by Engineer or Owner.

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.3 Re-install as required.

### **3.5 DISPOSAL**

.1 Dispose of removed materials, to appropriate recycling facilities except where specified otherwise, in accordance with authority having jurisdiction.

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**PART 1    GENERAL****1.1    SECTION INCLUDES**

- .1    Interior and exterior painting.
- .2    Relationship to other Sections:
  - .1    Various Sections describe additional installation requirements for painting described under this Section, including:
    - .1    Section 23 30 00 Ductwork
    - .2    Section 25 05 00 Controls
    - .3    Section 26 05 00 Electrical Equipment

**1.2    REFERENCE STANDARDS**

- .1    MPI-APL: MPI Approved Products List.
- .2    MPI-RM: MPI Maintenance Repainting Manual, 2004.
- .3    MPI-SM: MPI Architectural Painting Specifications Manual, 2007.
- .4    SSPC-PM1-PP: SSPC Painting Manual, Volume 1, 4th Edition, Good Painting Practice.
- .5    SSPC-PM2-SS: SSPC Painting Manual, Volume 2, 2008, Systems and Specifications.
- .6    GS-11: Green Seal 11 - Paint and Coatings.
- .7    SCAQMD-1113: SCAQMD Rule 1113 - Architectural Coatings.

**1.3    SUBMITTALS FOR ACTION**

- .1    Product Data
  - .1    Submit manufacturer's printed product literature, specifications and datasheet. Include product characteristics, performance criteria, options, and limitations.
  - .2    Include the following information:
    - .1    Product name, type, and use.
    - .2    Manufacturer's product number.
    - .3    Colour number(s).

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- .4 MPI Environmentally Friendly classification system rating.
- .5 Volatile Organic Compounds (VOC) content in grams per litre.

.2 Samples

- .1 Submit 200-mm by 300-mm (8-in by 12-in) sample panels of each paint, stain, coating or other finish with specified paint or coating in colors, gloss/sheen, and textures required to MPI-SM. Submit on substrate materials matching that of specified application surfaces.
- .2 Maintain approved samples on site to serve as standard of quality for appropriate on-site surface.

#### 1.4 SUBMITTALS FOR INFORMATION

.1 Operation and Maintenance Data

- .1 Submit manufacturer's application, cleaning, and maintenance instructions.

.2 Installer Qualification Statements

- .1 Upon request, provide a list of 3 comparable jobs including, date, job name and location, and project manager contact information.

#### 1.5 SUBMITTALS FOR CLOSEOUT

.1 Spare Paint

- .1 Provide spare paint on site for touch up purposes as required by Owner.

#### 1.6 QUALITY ASSURANCE

.1 Qualifications

.1 Installer

- .1 5-years proven satisfactory experience.

.2 Standard of Acceptance

- .1 Walls: No defects visible from a distance of 1-m (40-in) at 90-degrees to surface.
- .2 Ceilings: No defects visible from floor at 45-degrees to surface.

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- .3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.
- .3 Proof of Conformance
  - .1 Retain purchase orders, invoices and other documents to prove conformance with noted MPI requirements upon request.
- .4 Sample Areas
  - .1 When requested, prepare and paint designated surface, area, room, or item as specified for review and approval. When approved, the sample area shall become acceptable standard of finish quality and workmanship.

## 1.7 DELIVERY, STORAGE AND HANDLING

- .1 Delivery and Acceptance Requirements
  - .1 Deliver and store materials in original new containers, sealed, with labels intact.
  - .2 Remove damaged, opened, and rejected materials from site.
- .2 Storage and Handling Requirements
  - .1 Provide and maintain dry, temperature controlled, ventilated, secure storage.
- .3 Waste Management and Disposal
  - .1 Paint, stain and wood preservative finishes and related materials (thinners, solvents, etc.) are regarded as hazardous products and are subject to regulations for disposal.
  - .2 Material which cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.
  - .3 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.
  - .4 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into ground, the following procedures shall be strictly adhered to:
    - .1 Retain cleaning water for water-based materials to allow sediments to be filtered out.

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- .2 Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.
- .3 Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.
- .4 Dispose of contaminants as required including hazardous waste requirements.
- .5 Ensure empty paint cans are dry prior to disposal or recycling.

## **PART 2    PRODUCTS**

### **2.1    COMMON PRODUCT REQUIREMENTS**

- .1 Paint materials shall be listed in MPI-APL, having an "L" rating designation.
- .2 Paint materials shall be GS-11 certified.
- .3 Paint materials shall comply with SCAQMD-1113.
- .4 Paint materials for paint systems shall be products of a single manufacturer.
- .5 Paint materials shall be approved compatible with the substrate to MPI-RM, MPI-SM, SSPC-PM1-PP and SSPC-PM2-SS.
- .6 Paint materials shall be pre-mixed and pre-tinted unless otherwise indicated.

## **PART 3    EXECUTION**

### **3.1    EXAMINATION**

- .1 Verification of conditions to MPI-RM, MPI-SM, SSPC-PM1-PP and SSPC-PM2-SS.

### **3.2    PREPARATION**

- .1 Surface preparation to MPI-RM, MPI-SM, SSPC-PM1-PP and SSPC-PM2-SS.



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### 3.3 COMMON EXECUTION REQUIREMENTS

- .1 Ensure substrate and environmental conditions are acceptable before painting.
- .2 Paint surfaces, including interior and exterior, to MPI-RM, MPI-SM, SSPC-PM1-PP and SSPC-PM2-SS.
- .3 Mask required legible components including nameplates before painting.
- .4 Repainting of existing finishes to MPI-RM.

### 3.4 PAINTING

- .1 Paint surfaces as indicated.
- .2 Mechanical, Electrical and Related Services
  - .1 Unless otherwise indicated or noted, paint "unfinished" conduits, piping, hangers, ductwork and other mechanical and electrical equipment with color and texture to match adjacent surfaces, in the following areas:
    - .1 Where exposed to outdoor ambient conditions.
    - .2 Where exposed to outdoor temperature and humidity conditions.
    - .3 Where exposed-to-view in all exterior and interior areas.
    - .4 In high humidity interior areas.
    - .5 For systems at risk of condensation that have no other means of both insulation and vapour barrier.
    - .6 In service rooms including mechanical and electrical rooms.
  - .2 Leave exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish and touch up scratches and marks in unfinished areas.
- .3 Remaining Surfaces and Services
  - .1 Touch-up paint to match existing on surfaces and services affected by demolition, including removal of components that expose unfinished or non-matching surfaces and services.

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**3.5 FIELD QUALITY CONTROL****.1 Non-Conforming Work**

- .1 Correct deficiencies in painted surfaces to satisfaction of Owner.
- .2 Touch-up small affected areas.
- .3 Repaint large affected areas.
- .4 Scrape and/or sand defective paint surfaces before reapplication if required.

**3.6 PROTECTION AND CLEAN-UP**

- .1 Protect newly painted exterior surfaces from elements condensation and contamination until paint coatings are completely dry. Erect barriers or screens and post signs to warn, limit and/or direct traffic.
- .2 Remove spilled, splashed, splattered and over-sprayed paint as work progresses. Remove waste materials and keep area free from accumulation of tools, equipment, surplus materials and debris.

**End of section 09 91 00**

**PART 1    GENERAL****1.1    SECTION INCLUDES**

- .1    Air handlers.
- .2    Relationship to other Sections:
  - .1    Section 25 05 00 Controls describes control of equipment installed under this Section.
  - .2    Section 26 05 13 Wiring describes installation requirements of equipment installed under this Section.
  - .3    Section 26 05 00 Electrical Equipment describes equipment and components supplied with equipment and components from this section, including motors and variable speed drives.

**1.2    DEFINITIONS**

- .1    "Mineral Fibre": Mineral based insulation material made from either glass fibre, rock wool, or slag wool.
- .2    "TAB": TAB is used throughout this Section to describe the process, methods and requirements of testing, adjusting and balancing for HVAC.

**1.3    REFERENCE STANDARDS**

- .1    ASHRAE-90.1: ANSI/ASHRAE/IESNA-90.1-2007 Energy Standard for Buildings Except Low-Rise Residential.
- .2    ASHRAE-90.1-UM: ANSI/ASHRAE/IESNA-90.1-2007 Energy Standard for Buildings Except Low-Rise Residential User's Manual.
- .3    CSA-B52: CSA-B52-05 Mechanical Refrigeration Code.
- .4    CSA-B52-HB: CSA-B52-HB-05 Mechanical Refrigeration Code Handbook.
- .5    CSA-B52-S1: CSA-B52-S1-09 Mechanical Refrigeration Code Supplement 1.
- .6    AABC-TSB: AABC National Standards for Total System Balance 2002.
- .7    NEBB-TABES: NEBB Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems 2005.
- .8    TIAC-NIS: TIAC National Insulation Standard 2005.

## 1.4 SUBMITTALS FOR ACTION

### .1 Product Data

- .1 Manufacturer's printed product literature, specifications and datasheets, including product characteristics, materials, finish, dimensions, clearances, performance criteria, certifications, options, and limitations.
- .2 Include the following additional information:
  - .1 Capacity and efficiency, including full and part loading.
  - .2 Performance curves, including flow and resistance.
  - .3 Electrical, including schematics, ladder logic, wiring diagrams, control sequences.
  - .4 Required services, including utilities and distribution systems.
  - .5 Sound and vibration ratings.
- .3 Refrigerant Circuits Equipment
  - .1 CSA-B52 documentation.
- .4 Refrigeration Equipment: Include the following additional information:
  - .1 Efficiency and part load efficiency (25-%, 50-%, 75-%, and 100-% of design capacity).
  - .2 Turndown ratio.
  - .3 AHRI Ratings.
  - .4 Type of refrigerant used.

### .2 Shop Drawings

- .1 Schedule: List of products, including quantities, sizes, dimensions, locations.
- .2 Layout and Interference Plans: Scaled sketches indicating clearances, interferences, and relocation of interfering services, components, objects and structures.

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- .3 Mounting: Details of product mounting, including foundation details with loadings, anchor bolt arrangements, roof curb details, point loads, roof structure details.
- .4 Suspension Systems: Details of suspended products, including:
  - .1 Location of suspension.
  - .2 Maximum load at each of the suspension points.
  - .3 Size of suspension rods or members.
  - .4 Details of supplementary structural steel framing members.
- .5 Vibration and seismic control measures.
- .6 Electrical Power: Details of electrical power connections.
- .7 Interlocks: Details of electrical interlocks and life safety system interfaces, including schematics, ladder logic, wiring diagrams, control sequences.

## 1.5 SUBMITTALS FOR INFORMATION

- .1 Certificates
  - .1 Equipment Start-up: Letter from manufacturer certifying:
    - .1 Start-up, installation, adjustments and testing has been executed in accordance with manufacturer's instructions and recommendations, and no warranty conditions have been violated.
    - .2 Equipment is performing in accordance with expectations.
  - .2 Vibration Hardware Installation: Letter from manufacturer certifying start-up and installation has been executed in accordance with manufacturer's recommendations and Contract Documents.
  - .3 Performance
    - .1 Letter certifying ASHRAE-90.1 compliance.
    - .2 Documents on AHRI certification.
  - .4 Fuel Services Installation: Letter from installer certifying Work meets requirements.
  - .5 Combustion Venting Installation: Letter from installer certifying Work meets requirements.

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**.2 Manufacturer Information****.1 Operating and Maintenance Manual****.2 Installation Instructions****.3 Users Manuals****.4 Start-up Checklists****.3 Test and Evaluation Reports****.1 Start-up Reports: Completed manufacturer's start-up checklists and notes.****.2 Electrical: Measurements for equipment when off and powered up, for power as well as voltage and current measurements for each phase.****.3 Testing and Balancing Reports****.4 Qualification Statements****.1 Submit copies of Trades Licenses.****1.6 SUBMITTALS FOR CLOSEOUT****.1 Spare Parts****.1 Spare parts for 1 year of operation.****.2 Spare parts recommended by manufacturer.****.2 Tools****.1 Special tools required for Operation and Maintenance.****1.7 QUALITY ASSURANCE****.1 Qualifications****.1 TAB Personnel****.1 AABC or NEBB certified contractors.****.2 Subject to approval.**

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.2 Noise and Vibration Testing

- .1 The measurements shall be carried out by a competent person using equipment that meets general requirements of international standards following measurement methods that follow similar standards.

## **PART 2 PRODUCTS**

### **2.1 COMMON PRODUCT REQUIREMENTS**

- .1 Efficiency Performance: Provide equipment to meet the following requirements:
- .1 To ASHRAE 90.1.
- .2 Noise Performance: Provide equipment and services, including piping and ductwork, to meet the following requirements:
- .1 Occupied Areas: Less than 35-N.C. Level.
- .2 Service Areas: Less than 50-N.C. Level.
- .3 Vibration created by mechanical equipment must be below the level of perception in occupied areas of the building.

### **2.2 AIR HANDLERS**

- .1 Provide as indicated.

### **2.3 NOISE AND VIBRATION CONTROL**

- .1 Provide noise and vibration control hardware supplied by a single supplier.

### **2.4 EQUIPMENT MOUNTING**

- .1 Provide mounting including frames, supports, pads and curbs as required.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- .1 Verification of Conditions
- .1 Confirm all dimensions on drawings.

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- .2 Ensure clearances and maintenance access to equipment meet or exceed manufacturer's recommendations. Notify Engineer of problems.
- .3 Investigate required relocation of objects to prevent interference. Submit interference drawings as required.
- .4 Investigate wall construction for structural members, hazardous material, or utility services before opening.
- .2 Evaluation and Assessment
  - .1 Evaluate condition of equipment before Work. Report deficiencies to Engineer.
  - .2 Review proposed retrofits with manufacturer.
- .3 Measurement and Verification
  - .1 Measure full fire combustion efficiency before start of Work.
  - .2 Measure efficiency before start of Work.

### **3.2 PREPARATION**

- .1 Demolition and Removal
  - .1 Create or enlarge openings, including walls and or doorways, as required to permit installation of equipment and services.

### **3.3 COMMON EXECUTION REQUIREMENTS**

- .1 Provide services, including electrical and natural gas, to equipment as required.
- .2 Support equipment such that no loads are transmitted to services including piping, ductwork and electrical.
- .3 Provide equipment with identification as indicated. Nameplates to match quality and style of existing.
- .4 Meet seismic requirements as required.
- .5 Noise and Vibration Control
  - .1 Install vibration control hardware in accordance with manufacturer's instructions (and supervision where required) and only by workmen experienced in the installation of such systems.



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- .2 Replace isolation pads, and modify supports as required to mitigate vibration and noise to Owner's satisfaction.
- .6 Use valves and either unions or flanges to connect piping to equipment for ease of maintenance and assembly.
- .7 Provide clearances around systems equipment and components for inspection, servicing and maintenance and as required.
- .8 Replace services around equipment, including piping and ductwork, to fit equipment and to suit equipment requirements.
- .9 Provide equipment safeties and interlocks as required.
- .10 Manufacturer Services
  - .1 Start-up: Manufacturer to approve installation, to supervise start-up, and to instruct Owner, unless otherwise indicated.
  - .2 Adjusting: Adjust for optimal performance, under manufacturer supervision.
- .11 Adjusting: Adjust settings as required in Construction and throughout Correction Period to address safeties, operating limits, noise, efficiency, performance, and equipment longevity issues.

### 3.4 AIR HANDLERS

- .1 Install as required.
- .2 Filter Status: Modify sensitivity of differential pressure switch, and modify BAS alarm for air handler filter status to prevent false alarms at low fan speeds.
- .3 Configure air handler independent controls to prevent short cycling of heating and cooling stages.
- .4 Configure air handler independent controls to prevent overheating and overcooling including freezing.
- .5 Provide transition ductwork between existing building ductwork and air handler supply/return connections.
- .6 Start-up: Manufacturer to complete start-up.

### 3.5 EQUIPMENT MOUNTING

- .1 Intent: Contractor responsibility as requirements depends in part on final selection and installation location.

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- .2 Design mounting including frames, supports and curbs as required where not indicated.
- .3 Coordinate design of equipment mounting to be compatible with new roofing materials.
- .4 Performance: Design equipment mounting:
  - .1 To make equipment level.
  - .2 To protect equipment and building interior from water damage.
  - .3 To withstand seismic events with seismic restraint as required.

### **3.6 FIELD QUALITY CONTROL**

- .1 Field Tests
  - .1 Complete TAB, and submit report.
- .2 Field Inspections
  - .1 Submit report from vibration control hardware supplier certifying that the installation has been carried out in accordance with manufacturer's recommendations.
- .3 Non-Conforming Work
  - .1 Provide sound and vibration test report upon request for non-conforming area.
  - .2 Re-fabricate and re-install any installation of equipment, piping, and ductwork judged by Engineer to be unsound or poor with regard to the sound and vibration requirements.
- .4 Manufacturer Services
  - .1 Complete required tests on equipment.

### **3.7 CLOSEOUT ACTIVITIES**

- .1 Provide training to Owner.

**End of section 15 10 00**

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**PART 1    GENERAL****1.1    SECTION INCLUDES**

- .1 Natural gas piping, fittings, valves, pressure regulators, relief vents and gauges.

**1.2    DEFINITIONS**

- .1 "DN": Diameter Nominal (Metric)
- .2 "Gas Piping": Same as Natural Gas Piping.
- .3 "Gas Piping Components": Additional hardware required to complete a fully functional natural gas piping system, including pipes, fittings, valves, pressure regulators, relief vents and gauges.
- .4 "NPS": Nominal Pipe Size (Imperial)

**1.3    REFERENCE STANDARDS**

- .1 ASME-B31.9: ASME-B31.9-2008 Building Services Piping.
- .2 CSA-B149.1: CAN/CSA-B149.1-05 Natural Gas and Propane Installation Code.
- .3 CSA-B149.1HB: CAN/CSA-B149.1-HB-05 Natural Gas and Propane Installation Code Handbook.

**1.4    SUBMITTALS FOR ACTION**

- .1 Shop Drawings
  - .1 Gas Piping Routing
    - .1 Layout and Interference Plans: Isometric sketches indicating clearances, interferences, and relocation of interfering services, components, objects and structures.
    - .2 Fire Separations: Location of penetrations through fire separations.
    - .3 Pipe Drainage: Indicate details of piping slope angles and drainage where applicable.
    - .4 Expansion Compensation: Location of piping expansion control measures.
    - .5 Terminations: Indicate details and locations of terminations including regulator vents.

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- .2 Details of bases, hangers, and supports.

## **1.5 SUBMITTALS FOR INFORMATION**

- .1 Pressure Test Reports.
- .2 Qualification Statements
  - .1 Proof of gas licenses.

## **1.6 SUBMITTALS FOR CLOSEOUT**

- .1 Certificates
  - .1 Letter certifying the following meets requirements:
    - .1 Gas piping and gas piping components.
    - .2 Gas piping support and seismic restraint.

## **1.7 QUALITY ASSURANCE**

- .1 Qualifications
  - .1 Fuels Installer
    - .1 Company: Contractor licences for fuels including gas as required.
    - .2 Personnel: Trades licences for fuels including gas as required.

## **PART 2 PRODUCTS**

### **2.1 COMMON PRODUCT REQUIREMENTS**

- .1 The precise type, quantity and location of products furnished under this Section depends, in part, on routing and installation choices made by Contractor. Provide products:
  - .1 As indicated.
  - .2 To CSA-B149.1.
- .2 The precise type, quantity and location of Piping Components depends on equipment, routing and installation choices made by Contractor. Provide piping components:
  - .1 Rated to handle the extremes of temperature, pressure, abrasion, and corrosion to which they will be subjected.

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- .2 With materials suitable for the fluid type, including natural gas, and conditions to which they will be exposed.

## **2.2 PIPES**

- .1 Provide as required.
  - .1 Materials: To CSA-B149.1 unless otherwise indicated.
  - .2 Size: One nominal size larger than required by CSA-B149.1 unless otherwise indicated.

## **2.3 ANCHORS, GUIDES, SUPPORTS, AND HANGERS**

- .1 Design of piping support depends, in part, on routing and installation choices made by Contractor. Design of pipe support is Contractor responsibility.
- .2 Design pipe support systems to ASME-B31.9.
- .3 Performance
  - .1 Design pipe supports to withstand seismic events as required. Seismic restraint provisions shall meet or exceed requirements for post-disaster buildings in the respective seismic zone.
  - .2 Prevent pipe noise and vibration from being transferred to supporting structure.
  - .3 Angularity of rod hanger resulting from horizontal movement of piping from cold to hot position not to exceed 4-degrees from vertical.

## **2.4 FITTINGS**

- .1 Provide as required.
  - .1 Materials: To CSA-B149.1.

# **PART 3 EXECUTION**

## **3.1 PREPARATION**

- .1 Flush and clean new piping and products before being put into service.
- .2 Determine exact location and routes for piping. Modify routing and/or relocate existing services as required.
- .3 Remove existing paint and surface corrosion from gas piping to be repainted, down to base metal.

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### **3.2 COMMON EXECUTION REQUIREMENTS**

- .1 Replace existing gas piping as required, including gas piping to main headers.
- .2 Install products:
  - .1 As indicated.
  - .2 To CSA-B149.1.
  - .3 To CSA-B149.1HB.
- .3 Install to permit separate thermal insulation of each pipe unless otherwise indicated.
- .4 Group piping wherever possible.
- .5 Ensure gas piping is not supported from other services including piping.
- .6 Ensure other services including piping and wiring is not supported from gas piping.

### **3.3 PIPES**

- .1 Finish
  - .1 Paint new piping and fittings.
  - .2 Paint existing piping as indicated.
  - .3 Clean surfaces in accordance with paint manufacturers recommendations.
  - .4 Mask surrounding areas before painting.
  - .5 Paint with 1 coat of primer paint, 2 coats of exterior grade paint.
  - .6 Colour as approved by Owner.
- .2 Install drip pockets:
  - .1 At low points in piping system.
  - .2 At connections to equipment.

### **3.4 ANCHORS, SUPPORTS, GUIDES, AND HANGERS**

- .1 Design and provide anchors, supports, guides, and hangars as required.

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- .2 Adjust hangers to equalize load.
- .3 Fasteners: Wedge, sleeve or epoxy type anchor bolts. Refrain from using self-drilling or power-driven anchor bolts.
- .4 Anchors: Locate concrete anchors for equipment away from edges, stress joints, or existing fractures. Follow manufacturer's instructions on minimum anchor spacing.
- .5 Use trapeze type hangers where pipes are grouped together, unless otherwise indicated. Suspend horizontal member by adjustable rods with locking feature for maintaining level and slope. Provide auxiliary steel required to support trapeze between building steel.
- .6 Refrain from hanging pipe from another pipe unless otherwise indicated.

### **3.5 VALVES**

- .1 Install valves with stems upright or horizontal unless otherwise approved.
- .2 Install valves at branch take offs to isolate pieces of equipment, in addition to other indicated locations.

### **3.6 FIELD QUALITY CONTROL**

- .1 Test system to CSA-B149.1 and requirements of authorities having jurisdiction.

### **3.7 NON CONFORMING WORK**

- .1 In case of disputes regarding conformance of Work, retain and pay for a representative from applicable authorities having jurisdiction to inspect Work and provide a ruling.

### **3.8 ADJUSTING**

- .1 Purging: Purge after pressure test to CSA-B149.1.
- .2 Pre Start-up Inspections
  - .1 Check vents from regulators, control valves, and vent termination locations.
  - .2 Check gas trains.
  - .3 Ensure entire installation is approved by authorities having jurisdiction before start-up.

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.3 Post Start-up Adjustments

- .1 As required for performance.

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**PART 1    GENERAL****1.1    SECTION INCLUDES**

- .1    Ducts, dampers, connectors.
- .2    Relationship to other Sections:
  - .1    Section 25 05 00 Controls describes components including control dampers installed under this Section.

**1.2    DEFINITIONS**

- .1    "Concealed": Services and equipment in suspended ceilings and non accessible chases and furred in spaces.
- .2    "Ductwork": This refers to the sheet metal, joints, turning vanes, transitions, flanges, hangars, insulation mounts, and other accessories making up a duct section or sections.
- .3    "Exposed": Means not "concealed".
- .4    "Mineral Fibre": Mineral based insulation material made from either glass fibre, rock wool, or slag wool.
- .5    "TAB": Testing, Adjusting, and Balancing.

**1.3    REFERENCE STANDARDS**

- .1    ASTM-A480: ASTM-A480/A480M-09 Standard Specification for General Requirements for Flat Rolled Stainless and Heat Resisting Steel Plate, Sheet and Strip.
- .2    ASTM-A653: ASTM-A653/A653M-09 Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc Iron Alloy Coated (Galvannealed) by the Hot Dip Process.
- .3    ASTM-B209: ASTM-B209-07 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- .4    ASTM-C553: ASTM-C553-08 Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
- .5    ASTM-C921: ASTM-C921-09 Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
- .6    NFPA-90A: NFPA-90A-09 Standard for the Installation of Air-Conditioning and Ventilating Systems.

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- .7 ULC-S102: CAN/ULC-S102-07 Surface Burning Characteristics of Building Materials and Assemblies.
- .8 ULC-S115: CAN/ULC-S115-05 Standard Method of Fire Tests of Firestop Systems.
- .9 AABC-TSB: AABC National Standards for Total System Balance 2002.
- .10 NEBB-TABES: NEBB Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems 2005.
- .11 SMACNA-ADLTM: SMACNA HVAC Air Duct Leakage Test Manual, 1985, 1st Edition.
- .12 SMACNA-DCS: SMACNA HVAC Duct Construction Standards - Metal and Flexible, 3rd Edition 2005.
- .13 SMACNA-IAQG: SMACNA IAQ Guideline for Occupied Buildings Under Construction 2007, 2nd Edition.
- .14 TIAC-NIS: TIAC National Insulation Standard 2005.

#### **1.4 SUBMITTALS FOR ACTION**

- .1 Product Data
  - .1 Submit manufacturer's printed product literature, specifications and datasheet. Include product characteristics, performance criteria, options, and limitations.
- .2 Shop Drawings
  - .1 Duct Routing
    - .1 Layout and Interference Plans: Isometric sketches indicating clearances, interferences, and relocation of interfering services, components, objects and structures.
    - .2 Fire Separations: Location of penetrations through fire separations.
  - .2 Mounting: Details of bases, hangers, and supports.
  - .3 Wall Penetrations:
    - .1 Location of wall penetrations.
    - .2 Lintel support details.
    - .3 Wall-sleeve details including dimensions, fasteners, and sealing.

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- .4 Suspension Systems: Indicate the following for all suspended equipment:
  - .1 Location of suspension.
  - .2 Maximum load at each of the suspension points.
  - .3 Size of suspension rods or members.
  - .4 Details of supplementary structural steel framing members.
- .5 Details of firestop assembly:
  - .1 ULC assembly number certification.
  - .2 Required temperature rise and flame rating.
  - .3 Hose stream rating (where applicable).
  - .4 Thickness.
  - .5 Proposed installation methods.
  - .6 Material of firestopping and smoke seals, primers, reinforcements, damming materials, reinforcements, and anchorages/fastenings.
  - .7 Size of opening.
  - .8 Adjacent materials.
  - .9 Number of penetrations.
- .6 Labels: Scaled drawings indicating dimensions, layout, lettering, font, spacing, colours.
- .3 Indoor Air Quality Management Plan: Submit Indoor Air Quality (IAQ) Management Plan in accordance with SMACNA-IAQG.

## **1.5 SUBMITTALS FOR INFORMATION**

- .1 Certificates
  - .1 Letter certifying duct supports are in compliance with required seismic restraint provisions.
  - .2 Letter certifying that materials comply with specified performance characteristics and physical properties.
  - .3 Letter certifying duct supports are in compliance are in compliance with Contract Documents.

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## .2 Manufacturer Information

### .1 Operating and Maintenance Manuals

### .2 Installation Instructions

## .3 Balancing Reports

### .1 Balancing Reports compliant with NEBB-TABES or AABC-TSB recommendations.

### .2 Pressure Test Reports compliant with NEBB-TABES or AABC-TSB recommendations.

### .3 Pressure drops across intake and exhaust locations including louvres and grills.

### .4 Air temperatures at full equipment operation.

## .4 Qualification Statements

### .1 Proof of TAB certification.

## 1.6 QUALITY ASSURANCE

### .1 Qualifications

#### .1 TAB Personnel

##### .1 AABC or NEBB certified contractors

##### .2 Subject to approval.

## PART 2 PRODUCTS

### 2.1 COMMON PRODUCT REQUIREMENTS

#### .1 The precise quantity and location of ductwork depends on routing and installation choices made by Contractor. Provide ductwork:

##### .1 Rated to handle the extremes of temperature, pressure, abrasion, and corrosion to which they will be subjected.

##### .2 Constructed from materials suitable for the fluid type and conditions to which they will be exposed.

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.3 Constructed to pressure classification of the greater of unless otherwise indicated:

.1 SMACNA 3-in-w.g.

.2 Existing ductwork.

.4 As indicated.

.2 Certification: ULC labelled.

.3 Performance

.1 Noise Tolerances: Provide ductwork free from vibration, rattle or drumming under operating conditions.

## **2.2 MATERIALS AND FABRICATION**

.1 Provide ductwork of galvanized steel sheet with Z-275 (G90) zinc coating to ASTM-A653, unless otherwise indicated.

.2 Uninsulated exterior ductwork: Stainless steel, to ASTM-A480, Type 304.

.3 Shop or field fabricate buried rectangular ductwork from galvanized sheet, shop coated inside and outside with PVC.

.4 Cross-break flat surfaces as required to prevent vibration or buckling.

## **2.3 JOINTS AND SEAMS**

.1 Seal joints on ductwork to SMACNA standards.

.2 Manufacturers

.1 3M, EC800

.2 Foster Products, No. 30-07

.3 Hardcast, Iron Grip 601

.4 Duro-Dyne Canada Inc., S-2 or Transcontinental Equipment "MP"

.3 Longitudinal Joints: Use Pittsburgh Lock joints tightly closed along full length of seam.

.4 Transverse Joints: Use Ductmate Canada Ltd. or Nexus flanged connections, of class to suit size of duct.

.5 Gauge: Fabricate rectangular duct elbows, transition sections and take-off fittings of metal 1 gauge heavier than duct thickness of adjacent duct.

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- .6 Elbows: Use Pittsburgh Lock seams, with ends to match transverse joints of duct.

## **2.4 ELBOWS AND TRANSITIONS**

- .1 Provide elbows of standard radius design with inner radius equal to width of elbow unless otherwise indicated.
- .2 Provide mitred elbows in areas with restricted free space.
- .3 90-degree Radius Elbows: Smooth centre line radius of 1.5-times duct diameter, or 5-piece construction, subject to approval.
- .4 45-degree Radius Elbows: 3-piece construction.
  - .1 Provide branch connections to mains of eccentric conical configuration.
- .5 Mitered Elbows: Provide air turning vanes for mitered elbows, from 90-degree square elbows up to 45-degree elbows.
- .6 Air Turning Vanes: Provide small radius, single wall construction air turning vanes. Provide larger radius or double wall construction as required.

## **2.5 SUPPORTS AND HANGARS**

- .1 Provide supports and hangars as required. Adjust hangers to equalize load.
- .2 Provide mild steel rod hangers of 10-mm (3/8-in) dia. minimum size for ducts over 760-mm (30-in) in width. Provide 38-mm by 38-mm by 3-mm (1-1/2-in by 1-1/2-in by 1/8-in) steel angle across bottom of duct, attached to steel rods.
- .3 Provide strap hangers of 3-mm by 25-mm (1/8-in by 1-in) mild steel bar stock for ducts up through 760-mm (30-in) width unless otherwise indicated.

## **2.6 FIRE STOPPING AND SMOKE SEALS**

- .1 Asbestos-free materials and systems capable of maintaining effective barrier against flame, smoke and gases in compliance with requirements of ULC-S115.
- .2 Performance
  - .1 Fire stop rating: 2-hours, unless otherwise required.
- .3 Service penetration assemblies: Systems tested to ULC-S115.
- .4 Service penetration fire stop components: certified by test laboratory to ULC-S115.

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- .5 Foundations, exterior walls, and below grade floors: Waterproof, non-hardening.
- .6 Around penetrations for penetrations requiring vibration control: Elastomeric seal.
- .7 Damming and backup materials, supports and anchoring devices: To manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.

## **2.7 FLEXIBLE DUCT**

- .1 Provide single ply aluminum construction with mechanical lock spiral joints.
- .2 Manufacturers
  - .1 Flexmaster Co. Ltd., "Triple-Lock"
  - .2 Thermaflex
- .3 Provide flexible duct bearing as required.
- .4 Provide sealed joints between flexible duct and rigid ductwork or equipment, made with non-flammable high velocity duct sealer, applied in accordance with duct manufacturer's recommendations, and gear type nylon strap connectors.

## **2.8 FIRE DAMPERS**

- .1 Provide as required.
- .2 To NFPA-90A.
- .3 Certifications: ULC labelled.
- .4 Type: Hinged, fusible link type with channel frames, blades and housing. "Type B" fire dampers for rectangular or square ductwork and "Type C" fire dampers for round ductwork.
- .5 Furnish fire dampers and frame constructed of same material as duct in which they are installed.
- .6 Provide fire dampers in ductwork as indicated. Use type "A" fire dampers where minimum duct dimension is 250-mm (10-in) or greater. Use type "B" fire dampers where minimum duct dimension is less than 250-mm (10-in) and ensure damper blades are outside of air stream when in open position.

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**2.9 ACCESS HATCHES**

- .1 Type: Quick opening hardware.
- .2 Size: Minimum free opening of access hatches to be 0.1-m<sup>2</sup> (1-ft<sup>2</sup>).
- .3 Finish: To match wall and/or ceiling surfaces.

**2.10 DUCT INSULATION**

- .1 Provide insulation on all ductwork, unless otherwise indicated.
- .2 Provide adhesive, tape, sealants, cement, and mastic as recommended by, and compatible with, insulation and insulation jacket manufacturers.
- .3 Common Performance Requirements
  - .1 Flame-Spread: Maximum 25 tested to ULC-S102.
  - .2 Smoke Developed: Maximum 50 tested to ULC-S102.
- .4 Type MF - Preformed Mineral Fibre
  - .1 To ASTM-C553.

**2.11 JACKETS**

- .1 Provide jackets around insulated ductwork unless otherwise indicated.
- .2 Common Performance Requirements
  - .1 Flame-Spread: Maximum 25 tested to ULC-S102.
  - .2 Smoke Developed: Maximum 50 tested to ULC-S102.
- .3 Type CAB - Canvas Jacket
  - .1 Provide canvas jacket as indicated.
    - .1 ULC Listed.
    - .2 Fabric: ASTM-C921, 220-g/m<sup>2</sup> (6-oz/yd<sup>2</sup>), plain weave cotton treated with dilute fire retardant lagging adhesive.



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**.4 Type AL - Aluminum Jacket****.1 Provide aluminum jacket as indicated.****.1 To ASTM-B209.****.2 Thickness: 0.4-mm (0.016-in)****.3 Finish: Corrugated****.4 Joining: Longitudinal and circumferential slip joints with 50-mm (2-in) laps.****.5 Fittings: 0.5-mm (0.02-in) thick die shaped fitting covers with factory attached protective liner.****.6 Metal jacket banding and mechanical seals: 12-mm (1/2-in) wide; 0.5-mm (0.02-in) thick stainless steel.****PART 3 EXECUTION****3.1 EXAMINATION**

- .1 Photograph, document and submit descriptions of existing deficiencies in the affected systems, equipment, and surrounding areas prior to commencing work.**
- .2 Complete x-rays, scans, consultation, and other investigative work required to ensure that coring and drilling through floors and other structural members will not affect integrity.**
- .3 Investigate affected fire separations for existing improperly sealed or defective fire stopping.**

**3.2 COMMON EXECUTION REQUIREMENTS**

- .1 To SMACNA-DCS.**
- .2 Provide screens of 13-mm (1/2-in) mesh x 2.7-mm (0.105-in) diameter removable galvanized wire for air intakes, exhausts and open ends of ductwork.**
- .3 Provide steel framing, supports, and braces to hang or support ductwork as required.**
- .4 Provide required offsets and transitions, whether specifically indicated or not, to facilitate duct arrangement and to avoid interference with building structure, piping, equipment and services.**

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- .5 Install ductwork as close as possible to walls, partitions and overhead structures to attain maximum headroom and clearance.
- .6 Group ductwork wherever possible.
- .7 Install to permit separate thermal insulation of each duct unless otherwise indicated.
- .8 Install air sealing gaskets between flanged joints at duct connections to equipment.
- .9 Install ductwork size transitions such that angle between the transition and straight run does not exceed 15-degrees, unless otherwise indicated.
- .10 In occupied areas, paint interior of ductwork for at least 600-mm (2-ft) behind supply and exhaust grilles with matte black paint so as to render ductwork invisible from occupied space.
- .11 Provide necessary reinforcements, bracing, framing, and gaskets, to comply with performance criteria.
- .12 Labelling: Affix ductwork with weatherproof labels denoting service type and flow direction as required or at every 3-m (10-ft) of run or change of flow direction.

### **3.3 SUPPORTS AND HANGARS**

- .1 Fabricate duct support.
- .2 Design supports for easy removal.
- .3 Install supports and hangers at intervals not over 2.4-m (8-ft) centres for ducts up to 1.5-m (5-ft) in width and at 1.2-m (4-ft) centres for ducts 1.2-m (5-ft) in width and over.
- .4 Install miscellaneous steel angles or channels as required between joists or building steel for structural support of duct where building framing spacing does not coincide with the required hanger spacing.
- .5 Install 1 handle on either side of short dimension of duct to allow easy removal. Install backing washers or plate for added strength. Match materials to prevent galvanic corrosion.
- .6 Bend strap hanger around bottom of duct with a minimum of 38-mm (1-1/2-in) overlap and attach to sides and bottom of duct.
- .7 Adjust hangers to equalize load.

### **3.4 PENETRATIONS**

- .1 Install sleeves where ductwork passes through penetrations including walls, floors and ceilings.
- .2 Pack sleeves with resilient packing or fire rated packing as required.
- .3 Install sheet metal closure plates on each side of wall to cover sleeve.
- .4 Flash parts passing through or built into a roof, outside wall, waterproof floor or wet environments.
- .5 Patch holes to match existing surface.

### **3.5 FIRE STOPPING AND SMOKE SEALS**

- .1 Fire stop and smoke seal at:
  - .1 Penetrations through fire-resistance rated masonry, concrete, and gypsum board partitions and walls.
  - .2 Penetrations through fire-resistance rated floor slabs, ceilings and roofs.
  - .3 Openings and sleeves installed for future use through fire separations.
  - .4 Around mechanical and electrical assemblies penetrating fire separations.
- .2 Install fire stopping and smoke seal material and components in accordance with manufacturer's certified tested system listing.
- .3 Ensure integrity of fire separation is such that it prevents passage of smoke and hot gases to unexposed side of fire separation.
- .4 Repair fire stop holes, gaps, or improperly fire stopped penetrations in affected fire separation.
- .5 Install to allow for pipe movement due to thermal expansion.
- .6 Ensure integrity of insulation and vapour barriers.

### **3.6 FLEXIBLE DUCTWORK**

- .1 Provide continuous lengths, not to exceed 2.4-m (8-ft).

### **3.7 BALANCING DAMPERS**

- .1 Provide balancing dampers at each branch duct and where necessary for proper balancing of the system.

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**3.8 FIRE DAMPERS**

- .1 Provide fire dampers in ductwork passing through fire separations.

**3.9 ACCESS HATCHES**

- .1 Provide access panels at fire dampers, automatic dampers, coils and where required for maintenance.
- .2 Provide lockable access panels in drywall or fixed surfaces.

**3.10 DUCT INSULATION AND JACKETS**

- .1 Replace insulation on existing ductwork as indicated.
- .2 Replace damaged insulation on existing ductwork.
- .3 Install insulation, and seal seams and joints to prevent condensation or precipitation.
- .4 Install to TIAC-NIS.
- .5 Provide 50-mm (2-in) Type MF insulation and vapour barrier for exterior ducts with conditioned air.
- .6 Provide 25-mm (1-in) Type MF insulation and vapour barrier for supply air ducts.
- .7 Provide Type CAB jacket for interior exposed insulated ductwork.
- .8 Provide Type AL jacket for exterior exposed insulated ductwork.
- .9 Provide 25-mm (1-in) thick acoustic insulation as indicated.
- .10 Provide access to service components and devices, including nameplates, access hatches and doors, operable components.
- .11 Seams
  - .1 Match seam tape and seam sealant to jacket.
  - .2 Minimize the number of seams by using full length insulation pieces.
  - .3 Position overlaps to shed water.
  - .4 Locate longitudinal seams at the side of the ductwork that is least visible.

### 3.11 FIELD QUALITY CONTROL

- .1 Photograph ductwork at each stage of concealment including:
  - .1 Painting.
  - .2 Insulating.
  - .3 Installation of jacket.
  - .4 Wall finishing.
  - .5 Other obstructions or concealment.
- .2 VAV Balancing and Calibration
  - .1 Measure VAV box maximum and minimum air flows and compare to setpoints.
  - .2 Calibrate VAV maximum and minimum air volumes to a tolerance of +/- 10-%.
- .3 Outdoor Air Volume Control
  - .1 Measure existing minimum percent outdoor air volumes for each air handler.
  - .2 Control outdoor air volumes for each air handler to maintain existing minimum percent outdoor air.
- .4 Test ductwork before ducts are insulated, painted or concealed.
- .5 Immediately correct defects discovered during tests and retest systems as required.
- .6 Inspect and test ductwork for air leakage at joints and connections to equipment, under normal operating conditions. Provide systems leakage tests to SMACNA requirements.

### 3.12 CLEANING

- .1 Prior to start-up of fans, blow out complete systems of ductwork with high velocity air for not less than 2-hours using where possible using the installed air handling equipment to full capacity and by blanking off duct sections to achieve required velocity.
- .2 Do not install air filters prior to blow out of ductwork systems. Use auxiliary portable blowers for cleaning where installed fan systems are not adequate to blow out complete system free from dust and dirt.

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- .3 Clean interior of plenums, coils, and register, grille or diffuser outlet collars with industrial type vacuum cleaner.
- .4 On completion of cleaning process, replace filters before placing systems in final operation.

### **3.13 BALANCING**

- .1 Balance flows as indicated.
- .2 Balance flows as required where not indicated.
- .3 Tolerance: +/-5-%.
- .4 Allow for 2 additional site visits after receipt of Owner approval for comfort adjustments.
- .5 Allow for replacement of fan sheaves and belts to suit final balancing requirements.

### **3.14 ADJUSTING**

- .1 Supports and Hangars
  - .1 Vertical under normal operating conditions.
  - .2 Equalize loads.
  - .3 Adjust and modify to provide ductwork free from vibration, rattle or drumming under operating conditions.

**End of section 23 30 00**

**PART 1    GENERAL****1.1    SECTION INCLUDES**

- .1 Supervisory controllers, distributed controllers, end devices, control valves, control dampers, actuators.
- .2 Relationship to other Sections:
  - .1 Section 23 30 00 Ductwork describes installation requirements of components including control dampers furnished under this Section.
  - .2 Section 25 90 00 Control Sequences describes configuration and programming requirements of components including controllers furnished under this Section.
  - .3 Section 26 05 13 Wiring describes installation requirements of services including wiring furnished under this Section.

**1.2    INTENT**

- .1 This Section describes the scope, requirements, and intent of BAS. Provide design, construction, and commissioning services required to provide a system that meets the specified intent and requirements.
- .2 Intent of Work is to completely replace existing BAS with a new system as indicated. Reuse of existing controllers is prohibited.
- .3 Contractor agrees to assume all responsibility for assessing extent, nature and capabilities of the existing system, and waives future claims against errors or omissions in documentation or graphics screens.
- .4 Contractor acknowledges that depictions of extent of existing system contained within Contract Documents are for the sole purpose of providing a basis for comprehending the prescribed additional functionality, and not to provide an accurate or comprehensive description of existing BAS.

**1.3    DEFINITIONS**

- .1 "Affected Systems": Equipment, independent control systems, and HVAC systems that are not part of Work but whose operation may be impacted by Work.
- .2 "Building Automation System" or "BAS": A system comprising micro-processor based controllers, communications networks, and end devices that controls and monitors building systems through software including firmware and custom programming and user interfaces.

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- .3 "Distributed Controller": Microprocessor based controller that controls input and output points, typically for modular applications (e.g., VAV box control, Heat Pump Control, etc.). Typically, these controllers are networked to a supervisory controller rather than directly to a computer interface and standard browser application.
- .4 "End Device": Sensors, contacts, relays, actuators, solenoids, and any other device or equipment that either provides a signal to a BAS input point, or accepts control from a BAS output point.
- .5 "Graphical User Interface" or "GUI": The user interface with the BAS, usually installed on a client workstation.
- .6 "Proportional-Integral-Derivative Controller", or "PID Controller": A control loop feedback mechanism that attempts to correct the error between a measured process variable (e.g., temperature, pressure) and a desired setpoint by calculating and outputting a corrective action based on proportional, integral, and differential parameters.
- .7 "Run-Time Logs": An electronic collection of data collected when data changes values or states, including physical signals and virtual variables.
- .8 "Interval Logs": An electronic collection of data collected on regular time intervals, including physical signals and virtual variables.
- .9 "Supervisory Controller": Microprocessor based controller with sufficient processing power and memory to (i) act as a gateway for various communication protocols, (ii) obtain and store historical point and trend information from networked distributed controllers, and (iii) handle security, alarming, scheduling, computer interface and other higher level functions. Supervisory controllers may also act as a web server for graphics interfaces, and/or directly control input and output points.
- .10 "Trend Log": An electronic collection of data including run-time logs and interval logs.

#### 1.4 REFERENCE STANDARDS

- .1 ASHRAE-90.1: ANSI/ASHRAE/IESNA-90.1-2007 Energy Standard for Buildings Except Low-Rise Residential.
- .2 ASHRAE-90.1-UM: ANSI/ASHRAE/IESNA-90.1-2007 Energy Standard for Buildings Except Low-Rise Residential User's Manual.
- .3 ASHRAE-135: ANSI/ASHRAE-135-2008 BACnet - A Data Communication Protocol for Building Automation and Control Networks.



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## **1.5 ADMINISTRATIVE REQUIREMENTS**

- .1 Graphical User Interface Mock-up Procedures
  - .1 Install GUI mock-up on a computer (subject to approval), for review.
  - .2 Revise mock-up as required, until approved for style, layout, and aesthetics.
  - .3 Proceed with full programming of GUI.
  - .4 Completed GUI shall be subject to approval, based on aesthetic requirements defined by the approved mock-up.
- .2 Testing Plan Approval
  - .1 Submit Testing Plan for approval 20-days prior to testing.
  - .2 Revise the Testing Plan as required to the satisfaction of the Engineer.
  - .3 Submit the Testing Report demonstrating results of testing activities
  - .4 Coordinate testing activities with Commissioning activities.

## **1.6 SUBMITTALS FOR ACTION**

- .1 Product Data
  - .1 Submit manufacturer's printed product literature, specifications and datasheet. Include the following information:
    - .1 Product characteristics.
    - .2 Performance criteria.
    - .3 Options.
    - .4 Limitations.
    - .5 Photographs.
    - .6 Supplier information.
  - .2 Performance criteria for end devices includes accuracy, operating environment tolerances, and stability criteria.

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## .2 Shop Drawings

- .1 BAS network architecture diagrams including controllers, interconnections, repeaters and interfaces.
- .2 Control panel and controller schedules.
- .3 Floor plan drawings showing location of system components.
- .4 System schematics and flow diagrams indicating point location, name, and hardware address.
- .5 Points list describing hardware location, function, signal conditioning, and end devices for each point.
- .6 Details of BAS programming including:
  - .1 Sequences of operation.
  - .2 Descriptions of variables and constants.
  - .3 Software architecture.
  - .4 For sequential-style programming languages, provide commented line by line listings of code.
  - .5 For graphical-based programming languages, provide commented logic drawings.
- .7 Details of BAS data visualization and format including:
  - .1 Proposed trend log point grouping and scaling.
  - .2 Archive data format.
- .8 Sample of archived data in specified format.
  - .1 Minimum 24 hour duration.
  - .2 All required points.
- .9 Detailed Bill of Material list for each system or application, identifying quantities, part numbers, descriptions, and optional features.
- .10 Control Damper Schedule including a separate line for each damper provided and a column for each of the damper attributes, including: ID, Fail Position, Damper Type, Damper Operator, Duct Size, Damper Size, Mounting, and Actuator Type.

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- .11 Room Schedule including a separate line for terminal unit indicating location and associated BAS point, including airside and waterside terminal units including VAV boxes.
- .12 Wiring and ladder logic diagrams detailing required BAS interfaces and hardware interlocks.
- .13 Wiring and ladder logic diagrams describing important existing undocumented BAS interfaces and hardware interlocks.
- .14 Interlocks: Schematic and wiring diagrams detailing electrical interlocks and life safety system interfaces.
- .15 Layout and Interference Plans: Isometric sketches indicating clearances, interferences, and relocation of interfering services, components, objects and structures.
- .16 Fire Separations: Location of penetrations through fire separations.
- .3 Samples
  - .1 Zone End Devices: Submit samples of end devices, including zone temperature, humidity, and pressure sensors, to be located in occupied areas.

## **1.7 SUBMITTALS FOR INFORMATION**

- .1 Manufacturer Information
  - .1 Operating and Maintenance Manuals
  - .2 Installation Instructions
- .2 Testing Report: A report detailing the results of testing activities including the following:
  - .1 Dates of testing activities.
  - .2 Names and contact information of testing technician.
  - .3 Point Calibration Results: Include points tested, point values, measured values, discrepancies, and a description of corrective action taken.
  - .4 Output Testing Results: Include points tested and a summary of observations and corrective actions taken.
  - .5 Failure Mode Test Results.
  - .6 Software State Test Results

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- .7 Interlocks Test Results
- .8 Completed Testing Check List
- .3 Periodic Inspection Reports
  - .1 Provide written reports for each required post construction inspection including:
    - .1 Date of inspection.
    - .2 Climate conditions.
    - .3 Notes.
    - .4 Trend log printouts.
    - .5 Summary of adjustments or changes made.
    - .6 Updated documentation.
    - .7 Updated electronic copies of documentation.

## **1.8 SUBMITTALS FOR CLOSEOUT**

- .1 Operation and Maintenance Data
  - .1 3 copies, bound in binders containing:
    - .1 Table of contents.
    - .2 Shop Drawings updated and re-printed to accurately represent the as-built system.
    - .3 Manufacturers product data sheets or catalog pages for products including software.
  - .2 Pocket inserts, in each binder, holding optical discs (CD or DVD) with the following electronic information:
    - .1 Editable electronic files for drawings in MS Visio format.
    - .2 A duplication of the contents of the manual in Adobe PDF format.
    - .3 Archive copy of site-specific databases, software, configuration and sequences.
    - .4 Logically organized table of contents including dynamic links to relevant information.

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.5 Copies of software required to access electronic information.

.2 Tools and Software

.1 4 sets of common keys to BAS enclosures.

.2 Tools and Software

.1 Licenses to use proprietary software for an unlimited duration without additional fees. License shall include required software updates to maintain functionality.

.2 Copies of software, hardware security devices, and documentation.

.3 Provide highest level passwords and security access to hardware functions, configurations, and upgrades.

## 1.9 QUALITY ASSURANCE

.1 Installer Qualifications

.1 BAS Installation

.1 Regularly engaged in the engineering, programming, installation and service of similar systems.

.2 Office within a 100-km radius of Site, that offers complete maintenance and support services on a 24-hour/day, 7-days/week, 365-days/year basis. This office shall have direct access to or inventory of spare parts and all necessary test and diagnostic equipment required for installation, commissioning and servicing.

.2 GUI Mock-up

.1 Prepare working mock-up of GUI screens in sufficient detail to communicate look and feel of interface.

## 1.10 WARRANTY

.1 Special Warranty

.1 Include replacement of failed reused controllers, end devices, and sensors during Correction Period.

.2 Include modifications and tuning of PID controllers, logic, and sequences during Correction Period.

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- .3 Include labour and materials costs to remove, replace, and re-configure products provided under this contract should they become obsolete within 5-years.
  - .1 A product is deemed to be obsolete when the manufacturer ceases to manufacture, supply, or support replacement products that can directly replace the obsolete product.
  - .2 A product is deemed to be obsolete where replacement products are available, but require extraordinary configuration, costs, or additional hardware to replace the obsolete product.
- .4 Provide 12 monthly remote access sessions throughout the Correction Period to inspect and correct the operation of BAS in varying climate conditions.
- .5 Create backup copies, complete with version control designations and notations, of changes.

## **PART 2    PRODUCTS**

### **2.1    COMMON PRODUCT REQUIREMENTS**

- .1 System components, including controllers, end devices, power supplies, signal conditioning hardware, wiring and other equipment, shall be rated as required including to operate properly, within specified accuracy ranges, and in the extremes of the environment that they are to be located in.
- .2 Select component scale ranges to suit the application, including operating temperatures, pressure or vacuum, with readings at approximately mid-point on the scale where applicable.

### **2.2    SYSTEM ARCHITECTURE**

- .1 System shall be modular in nature, and shall permit expansion of both capacity and functionality through the addition of sensors, actuators, controllers and operator devices, while re-using existing controls equipment.
- .2 System architectural design shall eliminate dependence upon any single device for alarm reporting and control execution. The failure of any single component or network connection shall not interrupt the execution of control strategies at other operational devices.
- .3 Features
  - .1 Protection: Provide automatic protection for electronic equipment from power line transients and surges.

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- .2 Remote Access: Provide secured remote access to BAS functionality including points, graphics, trend log data, sequences, configuration, and administration. Functionality shall meet or exceed that available from the local GUI interface.
- .3 Remote Notification: Provide remote notification to notify remote staff of alarm conditions.
  - .1 Type: Alphanumeric pager and email.
- .4 Security: Provide functionality for multi-level password based access privileges to the system to include at a minimum:
  - .1 Level 4: Monitoring only. No changes to schedules, or points may be made.
  - .2 Level 3: As above plus the ability to manually command I/O points and change schedules.
  - .3 Level 2: As above plus the ability to change programming, trend logs, and graphics.
  - .4 Level 1: As above plus full access to other configuration and security features.
- .5 Web Server: Provide functionality including graphics, trend log data, data archiving, configuration, and administration. System to be accessible from a computer interface and standard browser application. Provide functionality of serving a minimum of 4 simultaneous users. Coordinate with Owner's IT department to configure IP addresses and firewall access ports.
- .6 Time Clock Synchronization: All controllers relying on real time information (for scheduling, trending, etc.) shall be periodically, automatically synchronized with one other.
- .7 Controller real time clocks to be periodically, automatically synchronized with a third party Network Time Server, such as ntp.com.
- .4 Performance
  - .1 System Scan Rate: System capable of refreshing physical point values once every 5-sec.
  - .2 Graphics Refresh Delay: Maximum 10-sec from request for refresh.
  - .3 Expansion Capability
    - .1 Minimum 100 networked controllers or nodes.

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- .5 Memory: Provide sufficient controllers, memory, and/or servers as required to meet requirements as indicated.

## **2.3 CONTROL PANEL ASSEMBLIES**

- .1 Provide NEMA rated enclosures, heaters, and humidity conditioning devices as required.
- .2 Provide hinged, enamelled steel enclosures, and locking slotted flush latch for control panel assemblies.
- .3 Ensure panels are neat including wiring.
- .4 Provide convenience 120-VAC duplex receptacle in each enclosure, complete with fused on/off power switch, and GFCI protection.
- .5 Provide colour coded and labelled wiring.
- .6 Remove obsolete components including controls and wiring when interfacing to existing panels.
- .7 Conceal panel wiring in new or reused panels using slotted PVC wiring ducts with covers.
- .8 If applicable, mount controller LCD or LED display modules flush in the panel face unless otherwise indicated.

## **2.4 SUPERVISORY CONTROLLERS**

- .1 Provide supervisory controllers as required.
- .2 Manufacturer
  - .1 Reliable Controls Corporation
  - .2 Automated Logic
  - .3 KMC Control
- .3 Type
  - .1 Communication Protocols
    - .1 BACnet Standard MS/TP Bus Protocol ASHRAE-135.
  - .2 Certifications and Standards
    - .1 BACnet Protocol Implementation Conformance Statement for the supervisory controller on the BACnet MS/TP Bus.



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- .3 Diagnostic LEDs for power, communication, and processor.
- .4 Memory: Non-volatile memory to maintain programming information and stored data in the event of a power loss.
- .5 Terminal Strips: Field removable blocks.
- .6 Capacity: Provide a minimum of 20-% spare input point capacity for each new controller, and 20-% new output point capacity for each new controller.

#### .4 Substitution Limitations

- .1 Substitutions may be accepted under the substitution provisions described in Contract Documents.
- .2 Substitutions may be limited by the following requirements:
  - .1 Availability of additional 2 service companies, compliant with Installer Qualifications as indicated, separate and independent from Contractor.

## 2.5 OTHER CONTROLLERS

- .1 Provide distributed controllers as required.
- .2 Manufacturer: Same as Supervisory Controllers
- .3 Type: Same as Supervisory Controllers, with the following additional requirements:
  - .1 Output Points: Provide local HAND-OFF-AUTO switches for output points.
  - .2 Terminal Strips: Field removable blocks.
  - .3 Capacity: Provide a minimum of 20-% spare input point capacity for each new controller, and 20-% new output point capacity for each new controller.

## 2.6 DESKTOP COMPUTER

- .1 Provide desktop computer as required by Owner. The following information is indicative of Owner requirements.
- .2 Manufacturer
  - .1 Dell Inc.
  - .2 Hewlett-Packard, Compaq

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- .3 IBM

- .3 Type

- .1 CPU: Pentium IV 3-GHz

- .2 Memory: 2-GB RAM

- .3 Hard Drive: 200-GB, 100-MB/sec

- .4 Operating System: Microsoft Vista or Microsoft XP SP3.

- .5 Components: DVD reader/writer, speakers, keyboard, mouse, USB ports, serial and parallel ports, network card with hard wired and wireless connectivity capable of operating on Owner's network.

## 2.7 MONITOR

- .1 Provide monitor as required by Owner. The following information is indicative of Owner requirements.

- .2 Manufacturer

- .1 NEC Corporation

- .2 Samsung

- .3 Acer Inc.

- .3 Type: Liquid Crystal Display (LCD)

- .1 Size: 19-in

- .2 Resolution: 1280x960 or better.

- .3 Refresh: 5-ms or faster.

- .4 Contrast Ratio: 1000:1 or higher.

## 2.8 PRINTER

- .1 Provide printer as required by Owner. The following information is indicative of Owner requirements.

- .2 Manufacturer

- .1 Hewlett-Packard

- .2 Canon Canada Inc.

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.3 Xerox Corporation

.3 Type: Laser, Colour

## **2.9 GRAPHICAL USER INTERFACE**

.1 Provide GUI allowing access to BAS features and functions including:

- .1 Ability to view all input points, output points, and system variables from graphical based screens.
- .2 Main Menu allowing easy navigation to other systems and graphical displays.
- .3 Readily available help menus and instructions for each operation and application including modes.
- .4 Custom written help screens for each system describing possible user adjustments and use.
- .5 Ability to easily navigate using graphical buttons from one display to another.
- .6 Floor layouts of building with relevant zone information displayed. Include relevant floor layout details including elevators, stairwells. Include additional relevant floor layout details if available by Owner in electronic format, including partitions, suite numbers, room labels. Include site plan. Include functionality to identify controlled zones with various colours to identify zone conditions relative to setpoint(s).
- .7 Simplified schematic of each system being controlled. Include points relevant to each system on the graphic. Schematics shall be:
  - .1 Hydraulically correct.
  - .2 Organized such that major equipment is positioned on the screen in a manner that is representative of the actual physical location and layout.
- .8 Clear written and graphical identification of specific operation(s) and mode(s) occurring.
- .9 Trend logs and alarm response screens.
- .10 User adjustments and overrides.
- .11 Inputs, Outputs, Setpoints, and parameters shown on the design drawings, or required as part of the system software, shall be displayed for operator viewing and modification from the operator interface software.

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- .12 Custom report definition and generation.
- .13 Alarm, non-normal, and return to normal condition annunciation.
- .14 Operation of the control system shall be independent of GUI, which shall be used for operator communications only.
- .15 Arrange graphics and screens in an intuitive, uncluttered manner.
- .2 Provide software licenses and installation assistance for 5 site installations.
- .3 Provide additional software licenses and installation assistance for 2 offsite installations.

## **2.10 COMMON END DEVICE REQUIREMENTS**

- .1 Specified accuracies and stability include errors associated with the sensor, lead wire, and analog to digital conversion.
- .2 Provide end devices as indicated, and as required for the application.
- .3 Select and size end devices to be suitable for the application, including ease of maintenance, adjustability, tolerances, signal resolution, inrush currents, and operating environment.
- .4 Provide, test, and calibrate sensors, transmitters, and other input devices as required.
- .5 Install end devices and related accessories in local enclosures where possible.
- .6 Install end devices in accessible locations.

## **2.11 OUTDOOR TEMPERATURE SENSORS (OTS)**

- .1 Provide as indicated.
- .2 Manufacturer: Greystone Energy Systems Inc.
- .3 Type: PVC enclosure, weatherproof, complete with sun and wind shield.
- .4 Options
  - .1 NTC: NTC Thermistor, compatible with controller.
  - .2 RTD: Platinum RTD, compatible with controller.
  - .3 CMB: Combination temperature and humidity sensor.

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**2.12 OUTDOOR HUMIDITY SENSORS (OHS)**

- .1 Provide as indicated.
- .2 Manufacturer: Greystone Energy Systems Inc.
- .3 Type
  - .1 Thermoset Polymer (capacitive), with non-interactive span and zero.
  - .2 Enclosure: PVC enclosure, weatherproof, complete with sun and wind shield.
  - .3 Stability: +/-1-%RH per 5-years
- .4 Options
  - .1 AC3: Accuracy +/-3-%RH.
  - .2 AC2: Accuracy +/-2-%RH.
  - .3 CMB: Combination temperature and humidity sensor.

**2.13 ZONE TEMPERATURE SENSORS (ZTS)**

- .1 Provide as indicated.
- .2 Manufacturer: Greystone Energy Systems Inc.
- .3 Type: Wall mounted, colour and style selected to match décor.
- .4 Options
  - .1 NTC: NTC Thermistor, compatible with controller.
  - .2 RTD: Platinum RTD, compatible with controller.
  - .3 LED: Light Emitting Diode display of temperature and setpoint, configurable to display in Celsius and Fahrenheit.
  - .4 LCD: Liquid Crystal Display of temperature and setpoint, configurable to display in Celsius and Fahrenheit.
  - .5 ADJ: Setpoint adjust potentiometer, or buttons.
  - .6 OCC: Pushbutton occupancy override button.
  - .7 USR: User defined buttons.
  - .8 CMB: Combination temperature and humidity sensor.

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- .9 GRD: Metal wire guard to protect sensor from physical damage.

## **2.14 DUCT TEMPERATURE SENSORS (DTS)**

- .1 Provide as indicated.
- .2 Manufacturer: Greystone Energy Systems Inc.
- .3 Type
  - .1 Enclosure: Metal receptacle box.
- .4 Options
  - .1 NTC: NTC Thermistor
  - .2 RTD: Platinum RTD
  - .3 PRO: Probe type, select probe length in accordance with manufacturer's instructions.
  - .4 AVG: Copper tube type, multiple sensors, select length to maximize quantity of sensors installed in application.
  - .5 FLX: Plenum rated cable type, multiple sensors, select length to maximize quantity of sensors installed in application.

## **2.15 DUCT STATIC PRESSURE SENSORS (DSP)**

- .1 Provide as indicated.
- .2 Manufacturer: Greystone Energy Systems Inc., T Series Differential Pressure Transmitter
- .3 Type
  - .1 Range: To suit application.
  - .2 Tubing: 4-mm (1/8-in) polyurethane tubing.

## **2.16 DIFFERENTIAL PRESSURE TRANSMITTER (DPT)**

- .1 Provide as indicated.
- .2 Manufacturer: Greystone Energy Systems Inc., T or W Series Differential Pressure Transmitter
- .3 Options

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- .1 AIR: T Series Differential Pressure Transmitter
- .2 WAT: W Series Differential Pressure Transmitter
- .3 LCD - Liquid Crystal Display: Display of pressure, configurable to display in selected units of psi unless otherwise indicated.
- .4 AAR - Analog Adjustable Relay: Analog to digital signal converter converting analog pressure reading to discrete relay output. Adjustable settings.
  - .1 Manufacturer: Greystone Energy Systems Inc., Model AAR

## 2.17 CURRENT SENSOR (CSN)

- .1 Provide as indicated.
- .2 Manufacturers:
- .3 Type: Split core current transformer.
- .4 Options
  - .1 CT: Accuracy 2-% F.S.O.
  - .2 RMS: True RMS, 4-mA to 20-mA excitation, accuracy 1-% F.S.O.

## 2.18 ACTUATORS (ACT)

- .1 Provide as required.
- .2 Manufacturers
  - .1 Belimo
  - .2 Bray International, Inc.
  - .3 Delta Control Products, Inc.
- .3 Type
  - .1 Size: Minimum 125-% required recommended valve or damper torque requirements.
  - .2 Adjustable Stops: Accessible, mechanical stops to limit travel in either direction.
  - .3 Manual Positioning: Gear release to allow manual positioning. Actuators with more than 7-N·m (60-in·lb) torque capacity shall have a manual crank for this purpose.

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- .4 Stall Protection: Mechanical or electronic stall protection to prevent damage to the actuator throughout the rotation of the actuator.

#### .4 Options

- .1 EL: Electrically Actuated (Default)

- .2 PNU: Pneumatic Actuated

- .3 FS: Feedback Signal

- .1 Independent true position feedback on Modulating and Floating Actuators.

- .4 MOD: Modulating Positioning Control

- .1 Repeatable positioning based on a 2-VDC to 10-VDC or 4-mA to 20-mA control signal.

- .2 Resolution/Positioning Accuracy: Minimum 80:1.

- .5 ON/OFF: On/Off Positioning Control

- .1 Open or Close position based on a digital control signal.

- .6 FLOAT

- .1 2 digital signals will open or close the actuator accordingly.

- .7 SR: Spring Return

- .1 An internal spring will reset the actuator to either open or closed position (field adjustable) in case of power failure.

- .8 QA: Quick Acting

- .1 Quick Acting actuators shall move full stroke within 20-sec.

- .9 ES: End Switches

- .1 Switches closing upon the actuator reaching fully open or fully closed position.

- .10 HTR: Heater

- .1 Line voltage electric heater, sized to prevent condensation on valve and actuator body.



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**2.19 GAS SENSORS (GS-CO2)**

- .1 Provide as indicated.
- .2 Manufacturer: Greystone Energy Systems Inc., Model CDD Carbon Dioxide Detector
- .3 Options
  - .1 ZN: Zone Mounted
  - .2 DT: Duct Mounted, ABS Enclosure
  - .3 LCD: Liquid Crystal Display
  - .4 CMB1: Includes RTD temperature sensor.
  - .5 CMB2: Includes 10-kohm thermistor and 2-% accuracy relative humidity sensors.

**2.20 CONTROL RELAYS**

- .1 Provide as required.
- .2 Type: Plug-in relays with separate base.
- .3 Options
  - .1 LED: Light Emitting Diode indicator.

**2.21 ELECTRIC CONVECTOR CONTACTORS (ECC)**

- .1 Provide as indicated.
- .2 Manufacturer: Cutler Hammer
- .3 Type: Screw terminals, visible state indicator.
- .4 Size: Minimum 150% of circuit rating.

**2.22 CONTROL DAMPERS**

- .1 Provide as required.
- .2 Manufacturers
  - .1 Tamco, Series 1000 or 9000
- .3 Type

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- .1 Type: Opposed blade, tight closing, low leakage.
- .2 Size: Size dampers to minimize airflow restriction and noise unless otherwise indicated.
- .3 Thermally Insulated: As required.
- .4 Materials: Damper frames and blades shall be constructed of either galvanized steel or aluminum with synthetic elastomer seals on blade edges and flexible stainless steel side seals.

## **2.23 POWER SUPPLIES**

- .1 Provide as required.
- .2 Type
  - .1 Switching or full bridge rectification.
  - .2 Fused.
  - .3 Size: 125-% rated load capacity.
  - .4 Features: Provide power disconnect switch.
- .3 Performance
  - .1 Line Regulation: +0.05-% for 10-% line change.
  - .2 Load Regulation: +0.05-% for 50-% load change.
  - .3 Ripple and Noise: 1-mV rms, 5-mV peak to peak.

## **2.24 CONTROL TRANSFORMERS**

- .1 Provide as required.
- .2 Type
  - .1 Fused or current limiting type.
  - .2 Size: 125-% rated load capacity.

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**PART 3    EXECUTION****3.1    EXAMINATION**

- .1 Submit relocation plan, and obtain approval before relocating services, panels, or equipment not specifically identified on drawings.
- .2 Complete sufficient examination of existing controllers or equipment ladder logic, including modifications, to properly interface and interlock controls.

**3.2    PREPARATION**

- .1 Demolition and Removal
  - .1 Patch openings, and refinish surfaces including walls where control equipment is removed or relocated.

**3.3    COMMON EXECUTION REQUIREMENTS**

- .1 Locate BAS components in accessible local enclosures.
- .2 Configure Supervisory Controllers, Distributed Controllers, and programmable devices to:
  - .1 As required.
  - .2 To ASHRAE 90.1.
- .3 Complete configuration on site, including programming and user interface.
- .4 Provide hard wired interlocks between equipment and safety devices.
- .5 Access: Provide passwords and software required to allow full read and write access to all BAS features.
- .6 Adjust control parameters and coordinate with other trades as required to achieve indicated air balancing, including outdoor air requirements.

**3.4    CONTROL PANEL ASSEMBLIES**

- .1 Locate enclosures at an elevation of not less than 610-mm (2-ft) from the bottom edge of the panel to the finished floor, subject to Owner approval.
- .2 Coordinate plans for panel location with other trades.

**3.5    COMPUTER WORKSTATION**

- .1 Confirm Owner requirements. Modify product requirements based on Owner requirements.

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- .2 Configure fully as required for intended use.

### **3.6 EQUIPMENT INTERFACE**

- .1 Interfacing controls into existing equipment shall be completed in a manner that maintains original equipment safeties, interlocks, and functionality whether or not these items were functional.

### **3.7 END DEVICES**

#### **.1 Temperature and Humidity Sensors**

- .1 Seal openings that route signal wires to temperature and humidity sensors to prevent air from other areas affecting the readings.
- .2 Seal sensors located in exterior walls to prevent air currents from interior wall space to impact sensor readings.

#### **.2 Outdoor Sensors**

- .1 Install sensors that record outdoor environmental conditions (including temperature, humidity, pressure) outdoors on north facing side of building, shielded from sun, reflection, and other heat or vent sources including ventilation, combustion, piping, plumbing.
- .2 Provide white painted aluminum vented shield as required, securely mounted to building around sensor.

#### **.3 Zone Static Pressure Sensors**

- .1 Mount indoor reference for static pressure sensors protected from moving air including ventilation, stack effect, elevator doors and lobbies. Obtain approval for location and termination method.

#### **.4 Zone Sensors**

- .1 Mount sensors on wall according to manufacturer's instructions. Confirm location with Owner.
- .2 Relocate existing sensors into zone area, including sensors located in ceiling plenum and ceiling areas.

#### **.5 Pipe Mounted Devices**

- .1 Provide thermowells as required.

#### **.6 Duct Mounted Devices**

- .1 Mount duct sensors in an electrical box through a hole in duct.

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## .7 Duct Averaging Sensors

- .1 Use averaging sensors for ductwork greater than 1.2-m (4-ft) in width or height, or in conditions with unevenly distributed air, including air temperature stratification and air turbulence.
- .2 Use a string of duct sensors mounted across the plenum in conditions with unevenly distributed air, including air temperature stratification and air turbulence. Include for wiring in series and parallel to produce average.

## .8 Differential Pressure Transmitters

- .1 Provide enclosure mounted tee fittings and shut-off valves in the high and low sensing pick-up lines to allow permanent, easy-to-use testing, calibration, and maintenance.

## .9 Current Sensing Switches

- .1 Calibrate current sensing switches for motor status to indicate positive run status only when motor is operating under load. Account for motors running under no or low load. A motor running with a broken belt or coupling shall indicate a negative run status.

## .10 Actuators

- .1 When not wired directly to an input, wire feedback signal of modulating actuators back to a terminal strip in the control panel for trouble-shooting purposes.

## .11 Relays

- .1 Install relays in enclosures.

## .12 Fire Detectors

- .1 Reuse and/or relocate existing fire and smoke detectors as required. Provide required testing, inspection and certification services.

## .13 Signal Isolation Transducers

- .1 Provide signal isolation transducers for analog output signals to be interfaced as inputs, including to and from BAS and independent control systems.

## .14 Signal Conditioning

- .1 Provide as required.

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### **3.8 WIRING**

- .1 Provide conduit for wiring unless otherwise indicated.
- .2 Trough Boxes: Use trough boxes to pull field wiring to central panels. Include minimum 610-mm (2-ft) of extra field wire length in the box.
- .3 Connections: Terminate signal wires at BAS Controller with screw terminals. Terminate 1 wire to each BAS Controller terminal.
- .4 Location: Terminate communications wiring leading to computers, office areas, or other finished areas in a junction box. Match cover plates and wall jacks with existing décor. Refrain from wiring through holes in walls or from ceiling plenums.
- .5 Use dedicated circuits for BAS power to controllers, power supplies, and electronic equipment.
- .6 Maintain minimum 610-mm (2-ft) clearance from equipment that may emit electromagnetic fields, including lighting ballasts.

### **3.9 COMMUNICATIONS**

- .1 Configure alphanumeric pages to describe the alarm condition.

### **3.10 ALARMS**

- .1 Configure alarms for input points to warn of values outside of normal range.
- .2 Alarm messages shall contain an informative response message describing the alarm event, probable cause, and suggested corrective action.
- .3 Configure GUI to allow management of alarm conditions, including acknowledging and clearing alarm conditions.

### **3.11 TREND LOGS**

- .1 Intent
  - .1 Logs are an important component of BAS.
  - .2 Use logs for commissioning, proof of performance, training, servicing, monitoring and troubleshooting.
- .2 Configuration
  - .1 Provide logs with information grouped by system in a logical manner to meet intent.

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- .2 Provide graphs for logs.
  - .3 For staged equipment, provide an analog variable representing the number of active stages to allow graphic representation of staging performance.
  - .4 Provide trend logs to meet the following requirements:
    - .1 Items to Trend: All hardware and software input points, output points, variables, and setpoints.
    - .2 Sampling Interval: 1-hour and 5-min
    - .3 Duration: Maintain a continuous record of minimum 2-weeks for each trend log. Store each sample in random access memory.
  - .5 Provide trend logs to meet the following additional requirements:
    - .1 Items to Trend: All hardware and software points subject to PID control, including setpoint, output point and input point.
    - .2 Sampling Interval: 1-min and 5-sec
    - .3 Duration: 24-hours
  - .6 Provide run-time logs for all digital points, variables, modes, and schedules.
  - .7 Provide additional trend logs as required under commissioning requirements, or as requested by Owner or Engineer.
- .3 Archiving
- .1 Provide hardware, software and configuration to automatically archive trend log data to computer hard drive, server database, or network file server.
  - .2 Format: As acceptable to Engineer including for ease of use of data.
    - .1 File Type
      - .1 Microsoft Excel
      - .2 ASCII (comma delineated)
      - .3 ASCII (fixed column width)
  - .3 Archiving shall not overwrite existing data.

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.4 Archive shall represent a complete, continuous record of trend log data without missing data.

.5 When stored as individual separate files:

.1 Files shall be automatically named in a consistent convention that includes the data start and stop date.

.2 Files saved in sequence shall be continuous without missing or duplicated data.

.4 Reporting

.1 Provide graphical plots of trend log reports from random access memory or archive, as required under commissioning requirements, or as requested by Owner or Engineer during correction period.

### **3.12 CONTROLLERS**

.1 Tune PID Controllers to prevent undershoot and overshoot and to ensure proper response times.

### **3.13 IDENTIFICATION**

.1 Node Identification: Identify network nodes by a permanent lamacoid label fastened to the enclosure. Labels shall be suitable for the environment.

.2 Color code cable types for easy identification and troubleshooting.

### **3.14 FIELD QUALITY CONTROL**

.1 Test each system independently and then in unison with other related systems.

.2 Complete point by point tests on all input and output points to:

.1 Test and calibrate analog input points.

.2 Test each digital input switching contacts, and digital input signal.

.3 Test each digital output to ensure proper operation, fail mode, and lag time.

.4 Test each analog output to ensure proper operation of controlled devices.

.5 Stroke actuated devices fully open and fully closed. Verify installation including tight closure, mechanical limit setting, and proper spring return orientation.



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- .6 Test and verify fail modes, interlocks, and other software modes of operation.
- .3 Adjust, test, and reconfigure affected systems to maintain original operation.
- .4 Correct problems with affected systems during the warranty period.
- .5 Submit test reports as required.
- .6 Fire Testing: Provide assistance as required for the next scheduled fire test.

### **3.15 ADJUSTING**

- .1 Adjust the following as required:
  - .1 PID parameters.
  - .2 Trend logs.
  - .3 Graphics.
  - .4 Point calibration.

### **3.16 CLOSEOUT ACTIVITIES**

- .1 Demonstration
  - .1 Demonstrate operation of systems including sequence of operations in regular and emergency modes, under normal and emergency conditions, start-up, shut-down interlocks and lock-outs.
- .2 Owner's Instructions
  - .1 On-Line Documentation: After completion of tests and adjustments Contractor shall provide a copy of as-built information and product data to be installed on a customer designated computer workstation or server.
- .3 Training
  - .1 Provide a minimum of 2 on-site training sessions, 1 day each, at the end of the contract period.
  - .2 This training shall include, at a minimum, the following:
    - .1 Project as-built drawings.
    - .2 BAS architecture, scope and intent.
    - .3 Sequences, variables, and naming conventions.

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- .4 GUI functionality, common day to day operations.
- .5 Troubleshooting procedures.
- .6 Backup and administrative procedures.
- .7 A walk through of the facility to identify panel and device locations.

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## **PART 1    GENERAL**

### **1.1    SECTION INCLUDES**

- .1 Building automation system sequences.
- .2 Relationship to other Sections:
  - .1 Section 25 05 00 Controls describes installation requirements of components including controllers configured and programmed under this Section.

### **1.2    DEFINITIONS**

- .1 See Section 25 05 00 Controls.
- .2 "Exhaust Air": Air exhausted from indoor zones.
- .3 "Mixed Air": A mixture of Return Air and Outdoor Air.
- .4 "Outdoor Air": Air from outside the building.
- .5 "Return Air" and "Entering Air": Air returning to equipment, usually from indoor zones.
- .6 "Supply Air": Air leaving equipment, for the purposes of providing heating, cooling, and/or ventilation.
- .7 "Return Water" and "Entering Water": Water or glycol entering heating or cooling equipment and piping systems.
- .8 "Supply Water" and "Leaving Water": Water or glycol leaving heating or cooling equipment and piping systems.
- .9 "Primary" and "Secondary": When referring to central plant heating or cooling piping, Primary refers to the piping directly connected to the central plant. Secondary refers to the piping which obtain their heating or cooling from the primary loop, and which are typically controlled to a temperature different than the primary loop.

### **1.3    REFERENCE STANDARDS**

- .1 See Section 25 05 00 Controls.
- .2 ASHRAE-62.1: ANSI/ASHRAE-62.1-2007 Ventilation for Acceptable Indoor Air Quality.
- .3 ASHRAE-62.1-UM: ANSI/ASHRAE-62.1-2007 Ventilation for Acceptable Indoor Air Quality User's Manual.

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**1.4 ADMINISTRATIVE REQUIREMENTS****.1 Sequences Review Meeting****.1** Meet with Engineer to review sequences in detail before implementation.**.2****.3** Walk through sequences in detail, and provide step by step commentary on control assumptions.**.4** Demonstrate how intent and programming requirements will be achieved.**1.5 SUBMITTALS****.1** See Section 25 05 00 Controls for submittal requirements.**PART 2 PRODUCTS****2.1 EXISTING PRODUCTS****.1** See Section 25 05 00 Controls.**PART 3 EXECUTION****3.1 EXAMINATION****.1** Evaluation and Assessment**.1** Evaluate and inspect existing sequences, performance, and functionality.**3.2 COMMON REQUIREMENTS****.1** Configure supervisory controllers, distributed controllers, and programmable devices as required to meet design intent as indicated.**.2** Create user adjustable variables for setpoints, limits, delays, offsets, scaling factors, and other constants used in programming logic. Minimize the number of such variables where possible.**.3** Unless otherwise indicated, sequences shall be programmed, tested and commissioned to achieve the following:**.1** Control temperatures to  $\pm 0.5^{\circ}\text{C}$  ( $\pm 0.9^{\circ}\text{F}$ ) from setpoint unless otherwise indicated.**.2** Minimize the number of equipment on/off cycles.**.3** Maximize the duration of equipment cycles.

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- .4 Eliminate unnecessary staging of equipment.
- .5 Prevent undershoot and overshoot on modulating equipment and actuator control.
- .6 Control and schedule equipment to maximize efficiency.
- .7 Minimize concurrent heating and cooling.
- .8 Automatically handle failed equipment or sensors by starting backup devices, and taking actions to minimize consequences.
- .9 Automatically prevent damage in case of end device or equipment failure (e.g., pipes freezing when heating fails).
- .10 Minimize tenant discomfort in case of equipment or sensor failure.
- .11 Notify Owner of alarm condition or failures.
- .4 Provide written detailed justification for choice of control strategy when requested by Engineer.
- .5 Complete necessary tests, trending, debugging, observation, and adjustments required to fine tune, adjust and modify sequences to meet design intent.
- .6 Notify Engineer of any problems or concerns with meeting design intent.
- .7 Follow request for clarification procedures to clarify issues regarding design intent.
- .8 Submit work in progress sequences, and walk through programming logic with Engineer upon request.
- .9 Indicated equipment operating limits should be considered as starting points or guidelines only. Consult with equipment manufacturer regarding recommended limits and operating constraints. Notify Engineer of any conflicts that may arise in meeting design intent.
- .10 Indicated sequences are intended to communicate suggested control strategies, and in no way absolve Contractor of responsibility as outlined in Contract Documents.
- .11 Provide automatic switchover between specified modes of operation without manual user intervention.

### 3.3 EXISTING SEQUENCES

- .1 Duplicate other existing functionality when changing or replacing controllers.
- .2 Coordinate new sequences with existing sequences.

### 3.4 COMMON SEQUENCES

#### .1 Modes of Operation

##### .1 Occupied Mode

- .1 This mode optimizes heating/cooling reset schedules and enable/disable switch-points for occupied loads and zone temperatures.
- .2 Scheduled based on daily, weekly and annual schedules.

##### .2 Unoccupied Mode

- .1 This mode optimizes heating/cooling reset schedules and enable/disable switch-points for unoccupied loads and zone temperatures.
- .2 Scheduled based on daily, weekly and annual schedules.

##### .3 Morning Start-up

- .1 This mode is used to bring the building out of setback to achieve occupied setpoint temperatures.
- .2 Scheduled based on daily, weekly and annual schedules, and adjusted for optimal start algorithms.

##### .4 Optimal Start Mode

- .1 This mode optimizes start-up of equipment to minimize energy use while ensuring zone temperatures are at setpoint during occupancy.
- .2 Based on occupancy schedules, adjusted by calculating the minimum amount of time required to run equipment before occupancy to meet occupied space conditions.
- .3 Time may vary based on outdoor air conditions, a recorded past history of heating and cooling times, and zone temperature feedback.

##### .5 Optimal Stop Mode

- .1 This mode optimizes the early shutdown of equipment to minimize energy use by taking advantage of building thermal mass.
- .2 Based on occupancy schedules, adjusted by calculating the maximum amount of time possible to disable equipment before vacancy, while meeting occupied space requirements.

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- .3 Time may vary based on outdoor air conditions, a recorded past history of heating and cooling times, and zone temperature feedback.
- .2 Provide the following functionality where applicable:
  - .1 Demand Limiting
    - .1 Stagger start-up of electrical equipment, where feasible, to minimize overall instantaneous electrical demand.
    - .2 Work with Owner to determine areas and systems subject to demand limiting.
    - .3 Provide single button activation of demand limiting strategies including the following:
      - .1 Temperature Setback: Add a user configurable offset to designated zones, to reduce cooling electrical demand.
      - .2 Fan Setback: Reduce the supply duct static pressure setpoint by a pre-determined amount to reduce fan electrical demand.
      - .3 Variable speed drive limitation: Add a user configurable speed offset on designated variable speed drives.
      - .4 Non-essential equipment shutdown.
  - .2 Scheduled Equipment: Provide functionality to schedule equipment based on occupancy schedules, outdoor air temperature switch-point, or on demand.
  - .3 Occupancy Override: Provide functionality for user to override schedules and force zone into occupied mode for a user adjustable duration. Start all required equipment in proper sequence, and maintain zone climate at occupied setpoint for the duration of the override.
  - .4 Occupant Adjustments: Provide functionality to limit adjustments within user defined limits per zone. Provide functionality to automatically reset adjustments on a periodic basis per zone.
  - .5 Equalized Run Time: Equalize the run time of equipment where possible by rotating the sequence to which staged equipment are enabled unless otherwise indicated.

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- .6 Optimal Lead/Lag: For equipment with different efficiencies, or significant variations in part load efficiencies, optimize sequencing to account for these effects. Example: controlling 2 modulating prime movers at 50-% load together, rather than having a single prime mover on, to account for improved efficiencies including higher part load efficiencies and reduced total distribution system losses or resistance. Another example: fixing the more efficient prime mover as the lead prime mover to operate during the bulk of the service hours.
- .7 Automatic Failover: Provide sequences to automatically and gracefully handle the failure of equipment by starting backup equipment.
- .3 Provide the following sequences where applicable:
  - .1 Improve energy efficiency.
  - .2 Improve occupant comfort.
  - .3 Improve equipment longevity.
- .4 Provide sequences to meet requirements of:
  - .1 ASHRAE-62.1
  - .2 ASHRAE-90.1
- .5 Coordinate sequences with safeties, safety systems, independent controls and interlocks.
- .6 Coordinate and adjust sequences to account for responses and interactive effects of existing independently controlled systems.

### 3.5 AIR HANDLER

- .1 Intent
  - .1 Improve energy efficiency:
    - .1 Improve air handler scheduling.
    - .2 Eliminate outdoor air during morning warm-up.
    - .3 Implement optimal start strategies.
    - .4 Economize based on enthalpy.
    - .5 Control outdoor air volumes using CO2 feedback (AC1 & AC2).
    - .6 Improve heating and outdoor air control.



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.2 Improve equipment longevity:

.1 Prevent excess staging.

.2 Considerations

- .1 Assume zone humidity loads are negligible compared to outdoor air humidity loads. With this assumption, economizer switch-points may be based on a fixed absolute outdoor air enthalpy value, rather than comparing return air enthalpy to outdoor air enthalpy.
- .2 Bypass damper is used instead of inlet vanes or VSDs to adjust duct static pressure. Adjustments in bypass air volumes can alter mixed air temperatures and cause erratic staging control. Coordinate bypass damper control with staging control.
- .3 When air distribution systems bypass air flow in the zones directly from SA to RA, the return air enthalpy will understate zone enthalpy and should not be used for economizer control.
- .4 Control staging and SAT on air handler systems to average readings of zone temperatures rather than relying on RAT sensors where feasible. The RAT is often not representative of average zone temperatures especially when dump boxes or bypass dampers are included in the distribution system.
- .5 Electric perimeter heating is more expensive than gas fired air heat. Minimize the use of electric baseboard heating.

.3 Modes of Operation

.1 Free Cooling Mode (Fixed Enthalpy)

- .1 This mode provides air-side free cooling.
- .2 Enabled based on an outdoor air enthalpy switch-point.
- .3 The switch-point is calculated by determining the enthalpy of the supply air temperature at setpoint, at saturation (95-% relative humidity).
- .4 BAS to have direct control of economizer damper position.

.2 Low Occupancy Mode

- .1 This mode is used in early morning where low occupancy requires air handler operation, but occupancy is low enough to allow restricted outdoor air.

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- .2 Enabled based on daily, weekly, and annual schedules.
- .4 Provide sequences as required including the following functionality:
  - .1 Morning start-up: Prevent heating or cooling outdoor air.
  - .2 Unoccupied zone warm-up: Start air handlers during unoccupied mode to prevent zone temperatures from dropping below a minimum setpoint.
  - .3 Free cooling failover: In case of humidity sensor failure, fail over gracefully to temperature controlled free cooling.
  - .4 Bypass Damper Control: Modulate bypass damper to maintain duct static pressure. Base this static pressure setpoint on observation of the existing system and seasonal adjustment.
  - .5 Outdoor air volume control (temperature): Control to minimum percent outdoor air using real time air temperature comparisons.

### 3.6 ZONE DAMPER CONTROL

- .1 Intent
  - .1 Improve comfort:
    - .1 Control air flow to zones.
    - .2 Coordinate air flow control with central air handlers.
- .2 Considerations
  - .1 Zone dampers may restrict outdoor air volumes to areas during heating or cooling switchovers. Ensure all zones get adequate outdoor air volumes by adjusting control parameters.
- .3 Modes of Operation
  - .1 Unoccupied Mode
    - .1 Close dampers during unoccupied modes. Allow dampers to open as required for heating and cooling.
  - .2 Heating Mode
    - .1 This mode is used for heating when space temperature is below setpoint, and air handler supply air temperature is above ambient temperature. In this mode, the air volumes will increase as the temperature falls below setpoint.

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.2 Set based on a combination of outdoor air temperature and zone feedback.

.3 Cooling Mode

.1 This mode is used for cooling when space temperature is above setpoint, and air handler supply air temperature is below ambient temperature. In this mode, the air volumes will increase as the temperature rises above setpoint.

.2 Set based on a combination of outdoor air temperature and zone feedback.

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**PART 1    GENERAL****1.1    SECTION INCLUDES**

- .1 Disconnects, motor starters, over-current protection.
- .2 Relationship to other Sections:
  - .1 Section 15 10 00 Mechanical Equipment describes equipment and components supplied with equipment and components from this section, and installed to this section, including motors and variable speed drives.

**1.2    DEFINITIONS**

- .1 As defined by CSA-C22.1, unless otherwise defined.

**1.3    REFERENCE STANDARDS**

- .1 CSA-C22.1: CSA-C22.1-09 Canadian Electrical Code, Part 1 (21st Edition), Safety Standard for Electrical Installations.
- .2 CSA-C22.1-HB: CSA-C22.1-HB-09 Canadian Electrical Code, Part 1 (21st Edition), Safety Standard for Electrical Installations Handbook.
- .3 CSA-C22.2: CSA-C22.2 Canadian Electrical Code, Part 2.
- .4 CSA-O80: CSA-O80-Series-08 Wood Preservation.
- .5 ULC-S102: CAN/ULC-S102-07 Surface Burning Characteristics of Building Materials and Assemblies.

**1.4    SUBMITTALS FOR ACTION**

- .1 Product Data
  - .1 Submit manufacturer's printed product literature, specifications and datasheet. Include product characteristics, performance criteria, options, and limitations.
- .2 Shop Drawings
  - .1 Layout and Interference Plans: Isometric sketches indicating clearances, interferences, and relocation of interfering services, components, objects and structures.
  - .2 Interlocks: Schematic and wiring diagrams detailing electrical interlocks.
  - .3 Mounting: Submit drawings for wall layouts for splitter, starter, disconnect, and other electrical device mounting for approval.

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**1.5 SUBMITTALS FOR INFORMATION****.1 Certificates**

.1 Letter from a qualified factory-trained manufacturer's representative certifying equipment has been installed, adjusted and tested in accordance with the manufacturer's recommendations.

.2 Certified production test results.

**.2 Manufacturer Information**

.1 Operating and Maintenance Manuals

.2 Installation Instructions

**.3 Qualification Statements**

.1 Proof of electrician licenses.

**1.6 QUALITY ASSURANCE****.1 Qualifications**

.1 Licensed Master Electrician.

**PART 2 PRODUCTS****2.1 COMMON PRODUCT REQUIREMENTS**

.1 Designed, manufactured, tested and certified in accordance with the latest applicable standards including ANSI, CSA, NEMA, UL and ULC.

.2 The precise type, rating, quantity and location of electrical products depend, in part, on routing and installation choices made by Contractor.

.1 Provide electrical products meeting relevant standards, including CSA-C22.2 and NEMA.

.3 Match fault current ratings equal to that of upstream over-current protection.

.4 Provide electrical products rated to suit environment.

**2.2 EQUIPMENT MOUNTING**

.1 Provide mounting including frames, supports, pads and curbs as required.

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**2.3 MOTOR CONTROLLERS**

- .1 Provide as indicated.
- .2 Manufacturers
  - .1 Eaton Corporation, Cutler-Hammer
  - .2 Schneider Electric
  - .3 Siemens Canada Limited
- .3 Type
  - .1 Bi-metallic Overload Relays
    - .1 Single phase sensitivity
    - .2 Visible trip indication
    - .3 Test trip feature
  - .2 Selector switch for HAND-OFF-AUTO.
  - .3 Fused control power transformer.
  - .4 Indicating lights for RUN and FAULT.
  - .5 Size: As required.

**2.4 DISCONNECTS**

- .1 Provide as indicated.
- .2 Manufacturers
  - .1 Eaton Corporation, Cutler-Hammer
  - .2 Schneider Electric
  - .3 Siemens Canada Limited
- .3 Type
  - .1 Fused or unfused as required.
  - .2 Industrial heavy duty, quick-make, quick-break, arc quenching.
  - .3 Lockout rings for "ON" and "OFF" position.

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.4 Enclosure: NEMA-3R

## **2.5 OVER-CURRENT PROTECTION**

.1 Provide as required.

.2 Manufacturers

.1 Eaton Corporation, Cutler-Hammer

.3 Type

.1 Match manufacturer, features, type, quality, and interrupting current rating of existing over-current protection where possible.

## **2.6 BACKING BOARD**

.1 Materials: Plywood.

.2 Treatment

.1 Pressure impregnated with fire-retardant chemicals to CSA-O80.

.2 Flame-Spread: Maximum 25 tested to ULC-S102.

.3 Size: 19-mm (3/4-in) thick.

.4 Finish: Painted to match panels.

## **2.7 SOURCE QUALITY CONTROL**

.1 Complete factory tests in accordance with NEMA, UL and ULC standards.

.2 Complete all laboratory and manufacturer testing required to refurbish existing over-current protection devices, and obtain required re-certification.

.3 Submit documentation and certified copies of test results.

## **2.8 EXAMINATION**

.1 Confirm the condition, installation, location, quantity and type of applicable equipment.

.2 Complete x-rays, scans, consultation, and other investigative work required to ensure that coring and drilling through floors and other structural members will not affect its integrity.

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## **2.9 PREPARATION**

### **.1 Protection**

- .1 Provide reliable backup power for electrical panels to prevent disruption as required.

## **2.10 COMMON EXECUTION REQUIREMENTS**

- .1 The precise type, rating, quantity and location of electrical products depend, in part, on routing and installation choices made by Contractor.
  - .1 Verify specified cable size, raceway size, insulation type, and over-current protection.
  - .2 Adjust sizing and selection of products as required.
- .2 Install products in locations providing appropriate ambient conditions for its operation, and allowing for adequate ventilation.
- .3 Install products to allow maintenance access and to prevent interference with adjacent equipment.
- .4 Should complications arise due to incorrect selection Contractor shall be responsible for costs incurred in replacing damaged components.
- .5 Vibration Isolation: Provide anti-vibration mounts or anti-vibration couplings when connecting wiring, conduit, or enclosures to mechanical equipment.
- .6 Power Surges: Protect upstream electrical equipment from power line, voltage transients and damage during construction power surges.
- .7 Mount new panels backing board using 25-mm (1-in) standoffs. Provide minimum of 300-mm (1-ft) clearance around all sides.

## **2.11 MOTOR CONTROLLERS**

- .1 Modify or replace existing motor controls where indicated, to provide manual override (HAND-OFF-AUTO) functionality.
- .2 Measure inrush and full load current upon start-up of motors.
- .3 Adjust overload settings as required.
- .4 Replace upstream over-current protection as required to prevent nuisance tripping on motor start-up.



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**2.12 EXISTING PANELS**

- .1 Energize all loads to simulate full load conditions.
- .2 Measure line to line, and line to neutral currents, voltage, and power factor before installation.
- .3 After installation of new circuits, energize all loads to simulate full load conditions.
- .4 Measure line to line, and line to neutral currents, voltage, and power factor.

**2.13 DISCONNECTS**

- .1 Install as required.

**2.14 OVERCURRENT PROTECTION**

- .1 Install as required.
- .2 Coordinate over-current protection with upstream over-current devices. Set adjustable settings for proper coordination.

**2.15 LABELLING**

- .1 Nameplates: Affix manufacturer's nameplates to equipment in a readily visible location.
- .2 Identification: Install lamacoid nameplates for identification on each enclosure, panel, or field equipment.
  - .1 Construction: Laminated plastic with a different coloured core and engraved lettering to clearly show lettering with style as follows, unless otherwise specified:
    - .1 Style: White capital letters, minimum 12-mm (1/2-in) high, centered (not justified), black background.
- .3 Warning: Install warning labels as required, including:
  - .1 Warning of automatic control.
  - .2 Warning of enclosures containing multiple voltages or multiple voltage sources.
- .4 Directories: Verify circuits on affected panels. Prepare updated written circuit directory on affected panel boards. Affix updated circuit directory to panel door, enclosed in a plastic protective sleeve.

Client: City of Guelph

Project: Roof &amp; Heating System Replacement

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**2.16 STARTUP****.1 Insulation Testing****.1 Test insulation integrity on circuits before powering:****.1 Visually inspect insulation.****.2 Complete sufficient meg-ohm meter (megger) measurements to confirm quality and integrity of insulation.****.2 Provide the services of a qualified factory-trained manufacturer's representative to assist with installation and start-up.****.1 Submit manufacturer's start-up report, and written certification that the equipment has been installed, adjusted and tested in accordance with the manufacturer's recommendations.****2.17 CLEANING****.1 Cleaning: Clean and vacuum enclosures and junction boxes after completion of work.****End of section 26 05 00**

Client: City of Guelph

Project: Roof &amp; Heating System Replacement

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**PART 1    GENERAL****1.1    SECTION INCLUDES**

- .1 Power wiring, raceways, communications wiring, control wiring, raceway, busway.
- .2 Relationship to other Sections:
  - .1 Section 15 10 00 Mechanical Equipment describes equipment and components installed under this section.
  - .2 Section 26 05 00 Electrical Equipment describes equipment and components installed under this section.

**1.2    DEFINITIONS**

- .1 As defined by CSA-C22.1, unless otherwise defined.

**1.3    REFERENCE STANDARDS**

- .1 CSA-C22.1: CSA-C22.1-09 Canadian Electrical Code, Part 1 (21st Edition), Safety Standard for Electrical Installations.
- .2 CSA-C22.1-HB: CSA-C22.1-HB-09 Canadian Electrical Code, Part 1 (21st Edition), Safety Standard for Electrical Installations Handbook.
- .3 CSA-C22.2: CSA-C22.2 Canadian Electrical Code, Part 2.
- .4 CSA-C22.2-45: CSA-C22.2 No. 45.1-07/45.2-08 Electrical Rigid Metal Conduit.
- .5 CSA-C22.2-56: CSA-C22.2 No. 56-04 Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
- .6 CSA-C22.2-83: CSA-C22.2 No. 83-M1985 (R2008)/83.1-07 Electrical Metallic Tubing.
- .7 CSA-C22.2-211.2: CSA-C22.2 No. 211.2-06 Rigid PVC (Unplasticized) Conduit.
- .8 ULC-S115: CAN/ULC-S115-05 Standard Method of Fire Tests of Firestop Systems.

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Project: Roof &amp; Heating System Replacement

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## 1.4 SUBMITTALS FOR ACTION

### .1 Product Data

- .1 Submit manufacturer's printed product literature, specifications and datasheet. Include product characteristics, performance criteria, options, and limitations.

### .2 Shop Drawings

- .1 Layout and Interference Plans: Isometric sketches indicating clearances, interferences, and relocation of interfering services, components, objects and structures.
- .2 Single Line: Single line electrical schematic showing:
  - .1 Cable size and quantity.
  - .2 Number of conductors per cable.
  - .3 Insulation type, and temperature rating.
  - .4 Raceway type, dimension, and support details.
  - .5 Maximum current capacity and code requirements.
- .3 Interlocks: Schematic and wiring diagrams detailing electrical interlocks.
- .4 Fire Separations: Location of penetrations through fire separations.
- .5 Details of firestop assembly:
  - .1 ULC assembly number certification.
  - .2 Required temperature rise and flame rating.
  - .3 Hose stream rating (where applicable).
  - .4 Thickness.
  - .5 Proposed installation methods.
  - .6 Material of firestopping and smoke seals, primers, reinforcements, damming materials, reinforcements, and anchorages/fastenings.
  - .7 Size of opening.
  - .8 Adjacent materials.
  - .9 Number of penetrations.

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## **1.5 SUBMITTALS FOR INFORMATION**

- .1 Certificates
  - .1 Production test results.
- .2 Manufacturer Information
  - .1 Installation Instructions
- .3 Qualification Statements
  - .1 Proof of electrician licenses.

## **PART 2 PRODUCTS**

### **2.1 COMMON PRODUCT REQUIREMENTS**

- .1 Designed, manufactured, tested and certified in accordance with the latest applicable standards including ANSI, CSA, NEMA, UL and ULC.
- .2 The precise type, rating, quantity and location of electrical products depend, in part, on routing and installation choices made by Contractor.
  - .1 Provide electrical products meeting relevant CSA-C22.2 standards.
- .3 Match fault current ratings equal to that of upstream over-current protection.
- .4 Provide electrical products rated to suit environment.

### **2.2 WIRE AND CABLE (POWER)**

- .1 Provide as required.
  - .1 Material: Copper for all conductors including integral ground wires.
  - .2 Minimum Size: #12AWG for power wiring.
  - .3 Type: Stranded for #10AWG and larger.
  - .4 Temperature: 90-°C (200-°F) unless otherwise indicated.
  - .5 Voltage
    - .1 Minimum 600-V.
    - .2 Cables between 575-V rated variable speed drives and motors shall be rated at 1000-V.

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Project: Roof &amp; Heating System Replacement

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- .6 Flame Rating: FT-4 or FT-6 to CSA-22.2 No. 0.3 unless otherwise indicated.

- .2 Cable Types

- .1 RW90-XLPE: Chemically cross linked thermosetting polyethylene material rated RW90. Suitable for wet and dry locations.
- .2 RWU90-XLPE: Chemically cross linked thermosetting polyethylene material with CSA type RWU90. Suitable for underground burial.
- .3 T90/TWN75: Thermoplastic insulation with CSA type TWH, with nylon jacket. Suitable for wet and dry locations.
- .4 TECK90: Armoured cable, polyvinyl chloride jackets on the outside and inside of the armour. Suitable for wet and dry locations.
  - .1 Armour: Interlocked aluminum.
  - .2 Conductor Insulation: Chemically cross linked thermosetting polyethylene material with CSA type RW90.
- .5 ACWU90: Armoured cable, polyvinyl chloride jacket, suitable for wet and dry locations.
  - .1 Armour: Interlocked aluminum.
  - .2 Conductor Insulation: Chemically cross linked thermosetting polyethylene material with CSA type RW90.
- .6 AC90: Armoured cable, no jacket, CSA type AC90. Suitable for dry locations.
  - .1 Armour: Interlocked aluminum.
- .7 RA90: Aluminum sheathed cable, CSA type RA90, polyvinyl chloride jacket. Suitable for wet and dry locations.
  - .1 Armour: Continuous aluminum sheath.
  - .2 Conductor Insulation: Chemically cross linked thermosetting polyethylene material with CSA type RW90.

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Project: Roof & Heating System Replacement

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## **2.3 WIRE AND CABLE (CONTROL AND COMMUNICATIONS)**

- .1 Provide as required.
  - .1 Material: Copper.
  - .2 Type: Stranded.
- .2 Insulation
  - .1 TW, PVC, or RW90.
- .3 Cables run exposed in ceiling plenums, and vertical chases:
  - .1 FT-4, Plenum rated.
- .4 Fire alarm, and life safety systems wiring and communications:
  - .1 FAS

## **2.4 CONDUIT**

- .1 Provide conduit for cables unless otherwise indicated.
  - .1 Minimum Size: 21-mm (3/4-in)
- .2 Type
  - .1 EMT: Electrical Metallic Tubing to CSA-C22.2-83.
  - .2 RMC: Rigid Metal Conduit to CSA-C22.2-45.
    - .1 Material: Aluminum or hot dipped galvanized steel.
  - .3 FMC: Flexible Metal Conduit to CSA-C22.2-56.
  - .4 PVC: Rigid PVC (Unplasticized) Conduit to CSA-C22.2-211.2.

## **2.5 SUPPORTS AND HANGERS**

- .1 The precise type, quantity and location of supports and hangers depends on routing and installation choices made by Contractor.
- .2 Provide as required.
  - .1 Materials: Metal, corrosion resistant.

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Project: Roof & Heating System Replacement

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.3 Unacceptable

.1 Wire lashing.

.2 Perforated straps.

## **2.6 ACCESS HATCHES**

.1 Provide lockable access hatches in ceilings where required for maintenance or convenience purposes.

## **2.7 FIRE STOPPING AND SMOKE SEALS**

.1 Asbestos-free materials and systems capable of maintaining effective barrier against flame, smoke and gases in compliance with requirements of ULC-S115.

.2 Performance

.1 Fire stop rating: 2-hours, unless otherwise required.

.3 Service penetration assemblies: Systems tested to ULC-S115.

.4 Service penetration fire stop components: Certified by test laboratory to ULC-S115.

.5 Foundations, exterior walls, and below grade floors: Waterproof, non-hardening.

.6 Around penetrations for penetrations requiring vibration control: Elastomeric seal.

.7 Damming and backup materials, supports and anchoring devices: To manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

.1 Photograph, document and submit descriptions of existing deficiencies in the affected wiring, busway, raceway, and support systems prior to commencing work.

.2 Complete x-rays, scans, consultation, and other investigative work required to ensure that coring and drilling through floors and other structural members will not affect its integrity.



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- .3 Investigate affected fire separations for existing improperly sealed or defective fire stopping.

### **3.2 PREPARATION**

- .1 Demolition and Removal
  - .1 Remove existing unused plenum cable in affected areas.
  - .2 Remove obsolete wiring, raceway, and support systems.
- .2 Verify specified cable size, raceway size, insulation type, and over-current protection.

### **3.3 COMMON EXECUTION REQUIREMENTS**

- .1 The precise type, rating, quantity and location of electrical products depend, in part, on routing and installation choices made by Contractor.
- .2 Verify characteristics of indicated components, including cable size, raceway size, insulation type, and over-current protection. Adjust sizing and selection as required.
- .3 Install products in locations providing appropriate ambient conditions for its operation, and allowing for adequate ventilation.
- .4 Install products to allow maintenance access and to prevent interference with adjacent equipment.
- .5 Install products to facilitate various activities including maintenance and inspection:
  - .1 Provide sufficient additional wiring lengths.
  - .2 Provide wiring quick disconnecting means.
- .6 Vibration Isolation: Provide anti-vibration mounts or anti-vibration couplings when connecting wiring, conduit, or enclosures to mechanical equipment.
- .7 Grounding: Provide a separate grounding conductor in conduit containing power circuits.
- .8 Power Surges: Protect upstream electrical equipment from power line, voltage transients and damage during construction power surges.
- .9 Install power wiring in continuous lengths without splices.
  - .1 Unacceptable: Splicing to existing power wiring.

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Project: Roof &amp; Heating System Replacement

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### **3.4 COMMUNICATION AND CONTROL WIRING**

- .1 Install communication and control wiring in separate raceway from other wiring.
- .2 Use dedicated enclosures for communication and control wiring whenever possible.
- .3 Document enclosures that contain mixed voltages, and/or circuits operating under separate control.
- .4 Splicing: Install communication and shielded control wiring in continuous lengths, free from splices.
- .5 Repeaters: Install communications repeaters as required.
- .6 Network Wiring: Install network wiring in daisy chain topology unless not allowed by controller manufacturer.

### **3.5 WIRE AND CABLE (POWER)**

- .1 Outdoor, wet, or damp locations except for underground burial:
  - .1 RW90-XLPE cable in RMC conduit.
- .2 Service and mechanical rooms, exposed, #10-AWG and smaller:
  - .1 RW90-XLPE cable in EMT conduit.
- .3 Service and mechanical rooms, exposed, #8-AWG and larger:
  - .1 RW90-XLPE cable in EMT conduit.
- .4 Concealed vertical chases:
  - .1 RW90-XLPE cable in EMT conduit.
  - .2 TECK90
- .5 Ceiling plenums, return air plenums, #12-AWG and smaller:
  - .1 AC90
- .6 Ceiling plenums, return air plenums, #10-AWG and larger:
  - .1 RW90-XLPE cable in EMT conduit.
  - .2 TECK90

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Project: Roof & Heating System Replacement

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### **3.6 CONDUIT**

- .1 Use FMC for connection to vibrating equipment.
  - .1 When used for vibration isolation, provide maximum 1-m (40-in) in length.
- .2 Use liquid tight connectors in damp, wet, or corrosive locations.
- .3 Conceal conduits, except within mechanical, electrical or service rooms.
- .4 Lay out conduit for drainage.
- .5 Maintain 150-mm (6-in) minimum clearance from piping, ductwork or venting.
- .6 Install conduits and raceways level, plumb, at right angles to the building lines. Follow the contours of the supporting surface.
- .7 Install bends and offsets uniformly without flattening.
- .8 Bend conduit with a minimum radius of 10-times the trade size of the conduit.
- .9 Provide telescoping joints where conduits cross building expansion joints, complete with flexible copper ground jumper.
- .10 Pull Wire: Provide a non-abrasive pull wire in conduit, with 300-mm (12-in) of slack at either end, and ends terminated under a screw.
- .11 Pull Boxes: Install Pull Boxes in conduit runs such that no cable will have to be pulled more than 2 90-degree bends or 30-m (100-ft) of conduit in 1 pulling operation.
- .12 Install insulated bushings on conduit ends.
- .13 Seal top end of vertical conduits.

### **3.7 ENCLOSURES AND JUNCTION BOXES**

- .1 Cover: Supply and install new covers to any enclosure or junction box missing covers. Use proper screws to secure cover.
- .2 Supports: Enclosures and junction boxes shall be supported independently of conduit, wire and cable.

### **3.8 SLEEVES**

- .1 Install sleeves in roof, wall, and floor penetrations.
- .2 Pack sleeves with resilient packing or fire rated packing as required.

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Project: Roof &amp; Heating System Replacement

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- .3 Flash parts passing through or built into a roof, outside wall or waterproof floor.
- .4 Patch holes to match existing surface.
- .5 Clearance between sleeve and uninsulated or insulated pipe:
  - .1 Below Grade: Minimum 25-mm (1-in).
  - .2 Other: Minimum 13-mm (1/2-in).
- .6 Material
  - .1 Concrete penetrations: Carbon steel schedule 40, primed and painted.
  - .2 Frame construction penetrations: 18-gauge galvanized steel sleeves.
- .7 Extend floor sleeves 38-mm (1-1/2-in) above floor surface.
- .8 Seal floor sleeves with an approved stiff setting caulking compound to serve as a water dam.
- .9 Conceal penetrations in finished areas with approved escutcheons.

### **3.9 FIRE STOPPING AND SMOKE SEALS**

- .1 Fire stop and smoke seal at:
  - .1 Penetrations through fire-resistance rated masonry, concrete, and gypsum board partitions and walls.
  - .2 Penetrations through fire-resistance rated floor slabs, ceilings and roofs.
  - .3 Openings and sleeves installed for future use through fire separations.
  - .4 Around mechanical and electrical assemblies penetrating fire separations.
  - .5 Repair fire stop holes, gaps, or improperly fire stopped penetrations in affected fire separation.
- .2 Install fire stopping and smoke seal material and components in accordance with manufacturer's certified tested system listing.
- .3 Ensure integrity of fire separation is such that it prevents passage of smoke and hot gases to unexposed side of fire separation.

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Client: City of Guelph

Project: Roof &amp; Heating System Replacement

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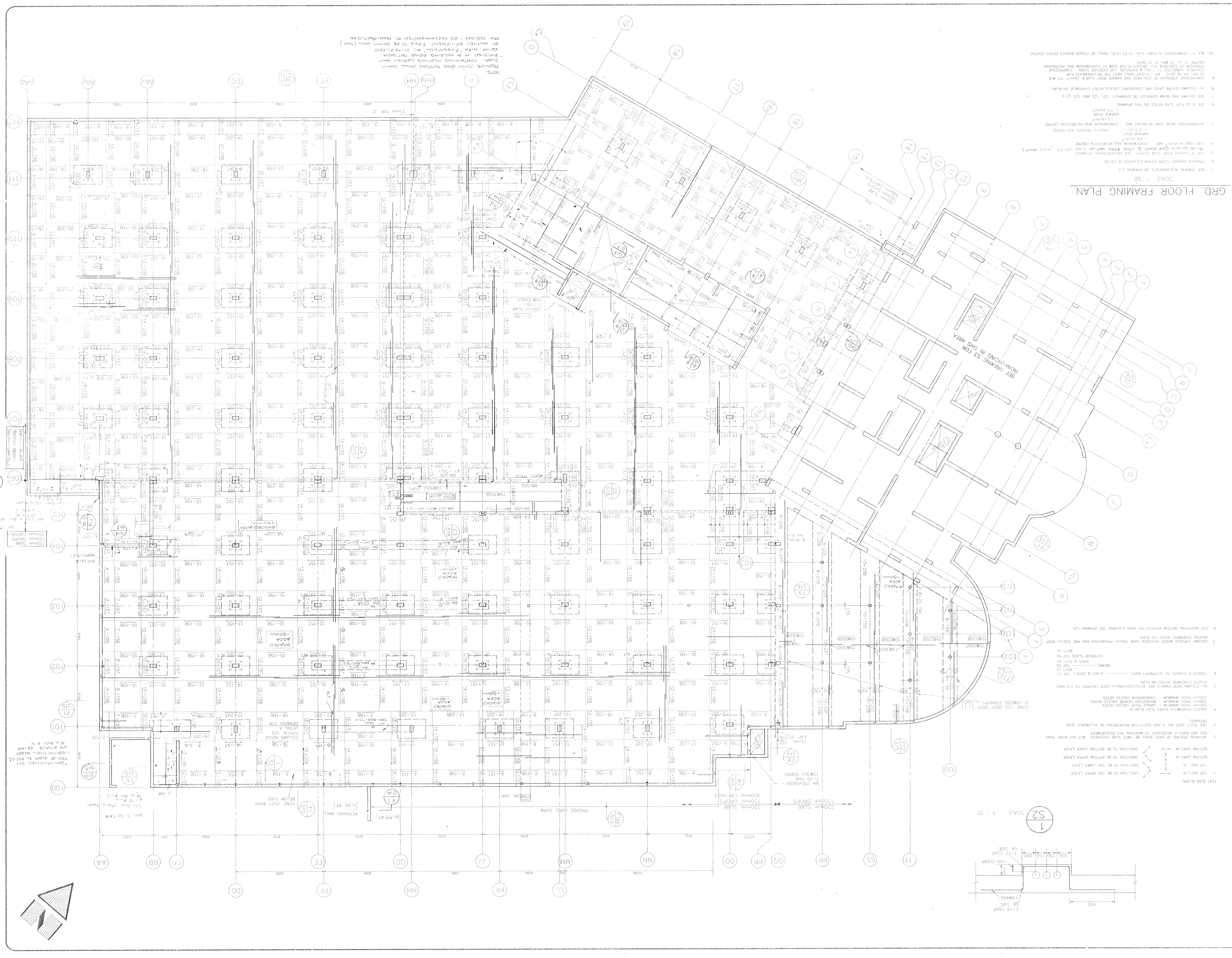
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**3.10 LABELLING**

- .1 Wire Markers: Label cable at both ends, and inside intermediate pull boxes and enclosures. Match existing labelling scheme if possible and if approved by Owner.
- .2 Control Wiring: Maintain consistent color-coding of control wiring. Match existing labelling scheme if possible and if approved by Owner.

**End of section 26 05 13**

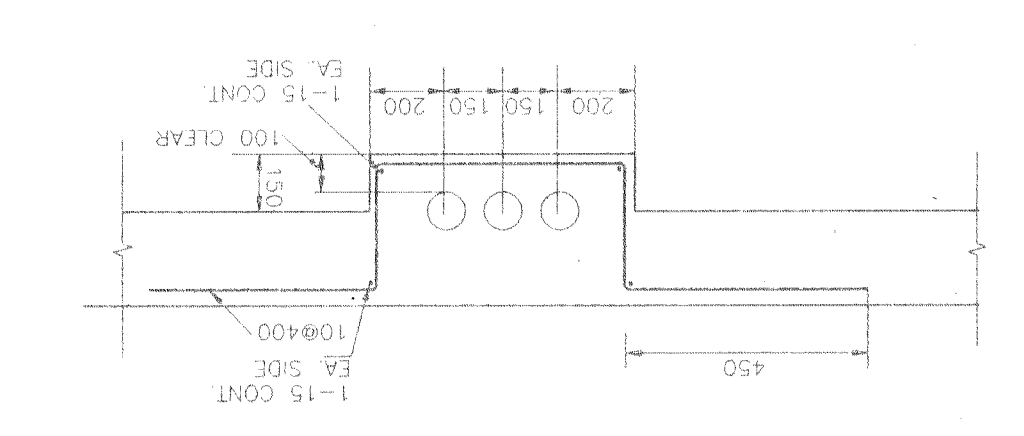




1. SET GENERAL REQUIREMENTS ON DRAWING S.150
2. FINISHED GROUND FLOOR RAVEL ELEVATION IS 331.50
3. TOP OF GROUND FLOOR RAVEL SLAB SEE ARCHITECTURAL DRAWINGS
4. 100mm THICK MINIMUM - REINFORCEMENT CENTRE UNLESS NOTED
5. UNLESS OTHERWISE NOTED FLAT SLAB IS 200mm THICK MINIMUM - COMPRESSION UNLESS NOTED
6. CONCRETE CORNERS TO OUTLETS/BAYS
7. UNLESS OTHERWISE NOTED ON PLAN
8. FOR ADDITIONAL BOTTOM REINFORCEMENT OVER COLUMNS SEE DRAWING S.25
9. ALL COLUMN CORNER REINFORCEMENT ARE 300mm PROJECTION AND 300mm DEEP
10. ALL REINFORCEMENT IN SLAB SHALL BE 10mm BENT EPOXY COATED

GRD. FLOOR FRAMING PLAN

SCALE: 1:20



Project: RIVERSIDE CONDOMINIUM PROJECT  
GUELPH, ONTARIO  
MEDHURST HOGG SOBOTKA  
Architects: gbor+ popper+ architects  
Date: 1.150  
Project #: 88-263  
Drawn by: K.H. Mo  
Scale: 1:20

no.	date	issues & revisions
1	01/01/93	REVISION TO AND INCLUDING GROUND FLOOR LEVEL
2	01/01/93	REVISION TO AND INCLUDING GROUND FLOOR LEVEL
3	01/01/93	REVISION TO AND INCLUDING GROUND FLOOR LEVEL

DO NOT SCALE DRAWINGS  
CONTRACTOR TO VERIFY ALL DIMENSIONS TO THE ARCHITECT IN WRITING BEFORE WORK COMMENCES  
ALL DIMENSIONS AND SPECIFICATIONS TO REMAIN THE PROPERTY OF THE ARCHITECT

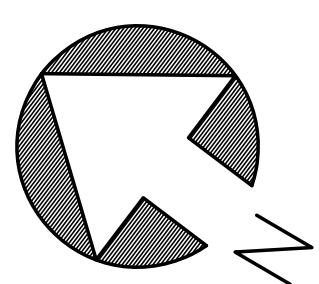


GENERAL NOTES

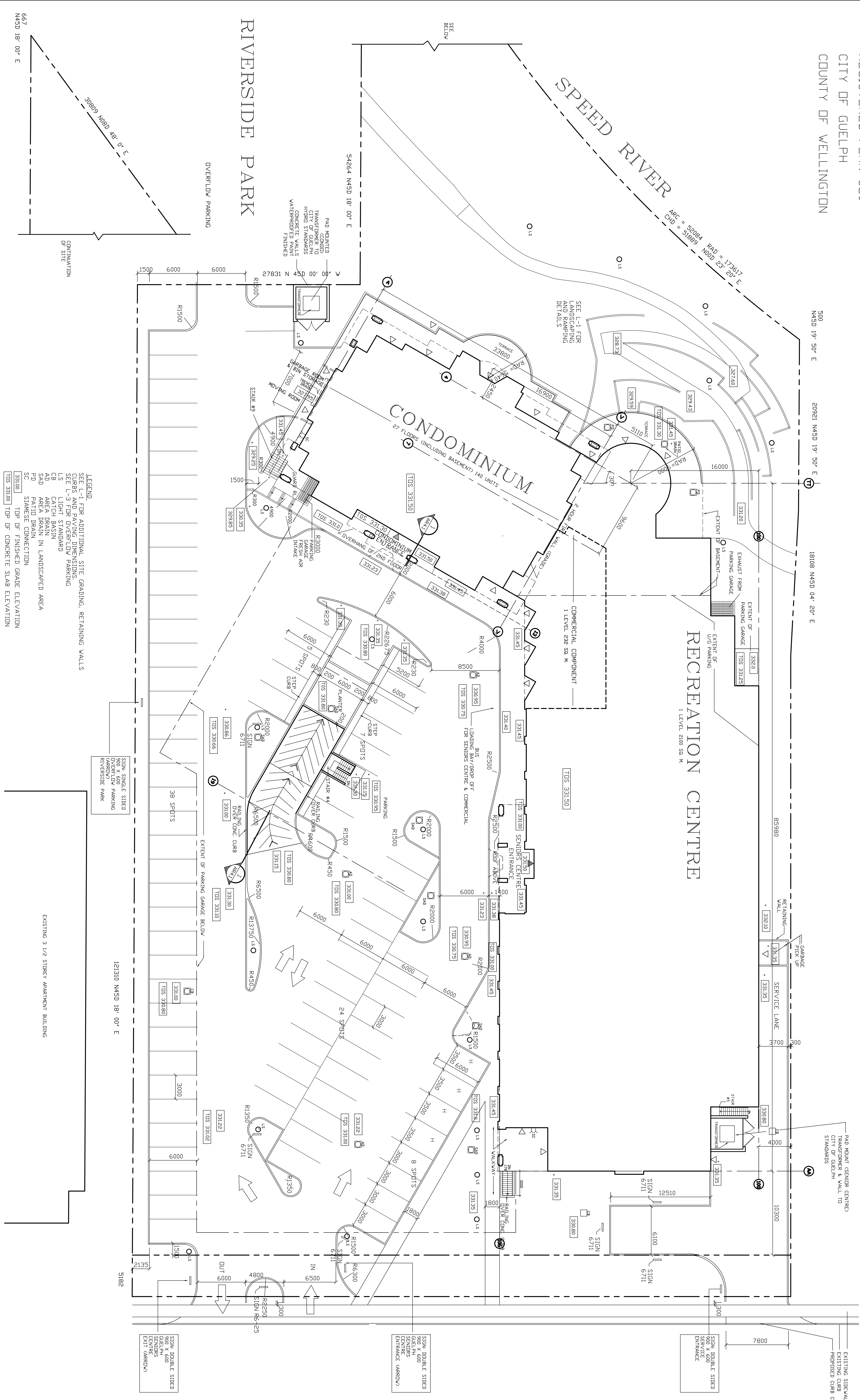
DO NOT SCALE DRAWINGS

CONTRACTOR TO VERIFY ALL DIMENSIONS ON SITE AND REPORT ANY DISCREPANCIES OR DISCREPANCIES TO THE ARCHITECT IMMEDIATELY. ALL DIMENSIONS SHALL BE IN METERS UNLESS OTHERWISE NOTED.

ALL DRAWINGS AND SPECIFICATIONS TO REMAIN THE PROPERTY OF THE ARCHITECT



PLAN OF SURVEY  
OF  
LOTS A & B AND PART OF LOT C  
REGISTERED PLAN 320  
CITY OF GUELPH  
COUNTY OF WELLINGTON



NO.	DATE	ISSUES & REVISIONS
1	2017 06/29	REVISED AND ISSUED FOR SITE PLAN APPROVAL
2	NOV 1/20	ISSUED FOR REVIEW
3	FEB 7/20	REVISED AND ISSUED FOR SITE PLAN APPROVAL
4	FEB 22/20	REVISED AND INFORMATION ADDED
5	FEB 26/20	ISSUED FOR BUILDING PERMIT
6	MAR 9/20	REVISED AND ISSUED FOR SITE PLAN APPROVAL
7	MAR 21/20	REVISED AND ISSUED FOR TENDERS
8	29 JUN 20	ISSUED FOR CONSTRUCTION

gabor+  
popper  
architects

RIVERSIDE  
CONDOMINIUM PROJECT  
GUELPH, ONTARIO  
RIVERSIDE (GUELPH) CORP.

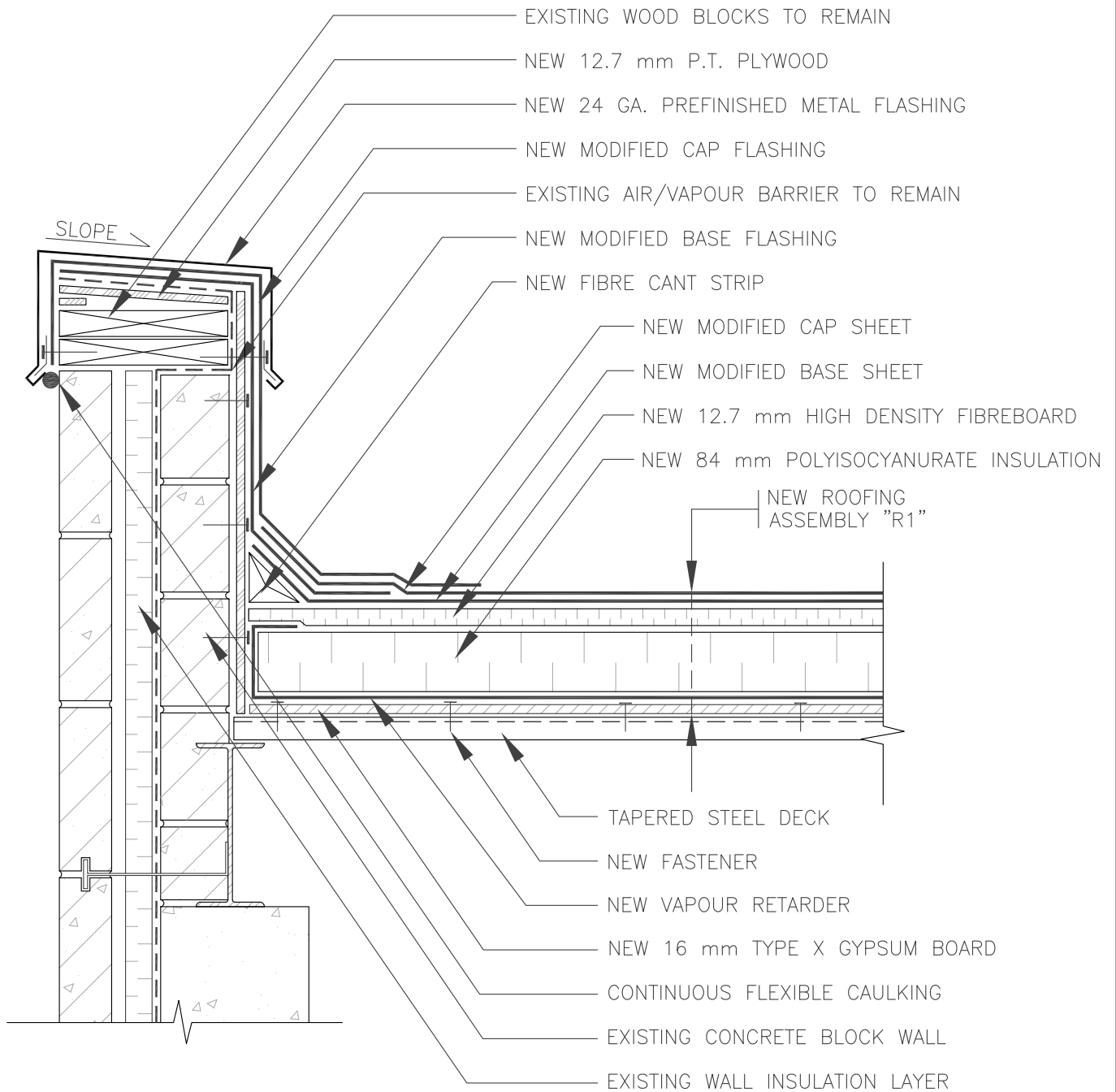
PROJECT	DATE	PROJECT #
DATE	JULY 6, 1989	188-203
SCALE	1:2500	DRAWN BY
DATE	1/20	CHECKED

SITE PLAN

A1.1







SECTION 1-1  
N.T.S.

CLIENT:

CITY OF GUELPH  
59 CARDEN STREET  
GUELPH, ONTARIO  
N1H 3A1



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www.buildingsciences.net

PROJECT:

ROOF AND HEATING SYSTEM REPLACEMENT AT  
EVERGREEN SENIOR'S CENTRE  
683 WOOLWICH STREET  
GUELPH, ONTARIO

TYPICAL ROOF PARAPET DETAIL

DATE: APRIL 2010

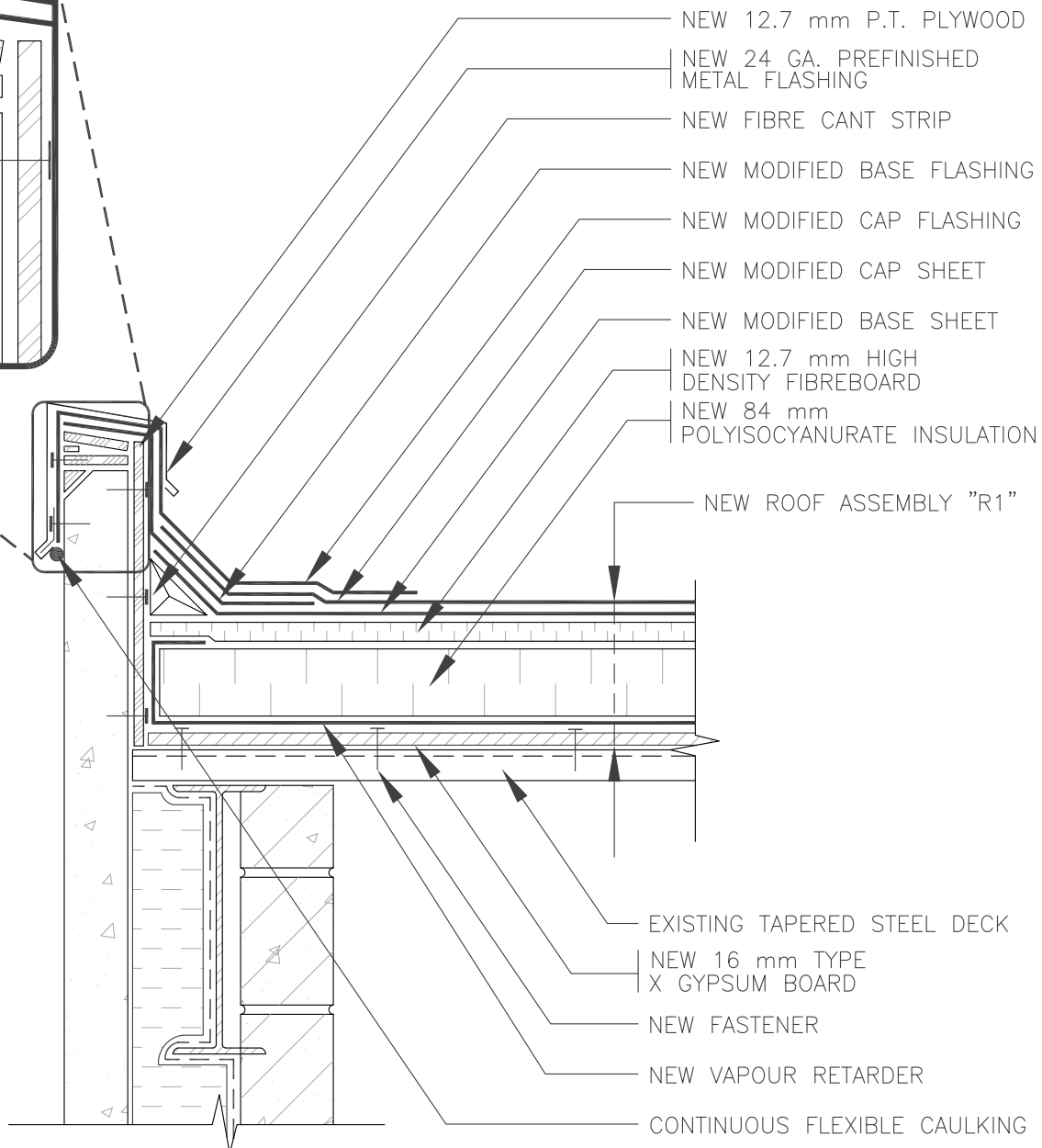
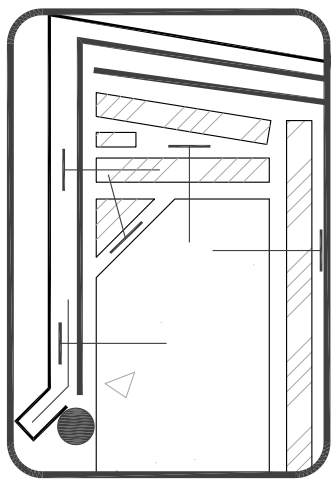
SCALE: N.T.S.

DRAWN BY: H.S.

APPROVED BY:

B. T. MARASHI, P. ENG.  
ACCENT BUILDING SCIENCES

**D1**  
OF 7



SECTION 2-2  
N.T.S.

CLIENT:

CITY OF GUELPH  
59 CARDEN STREET  
GUELPH, ONTARIO  
N1H 3A1



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PROJECT:

ROOF AND HEATING SYSTEM REPLACEMENT AT  
EVERGREEN SENIOR'S CENTRE  
683 WOOLWICH STREET  
GUELPH, ONTARIO

CONCRETE WALL TO ROOF DETAIL

DATE: APRIL 2010

APPROVED BY:

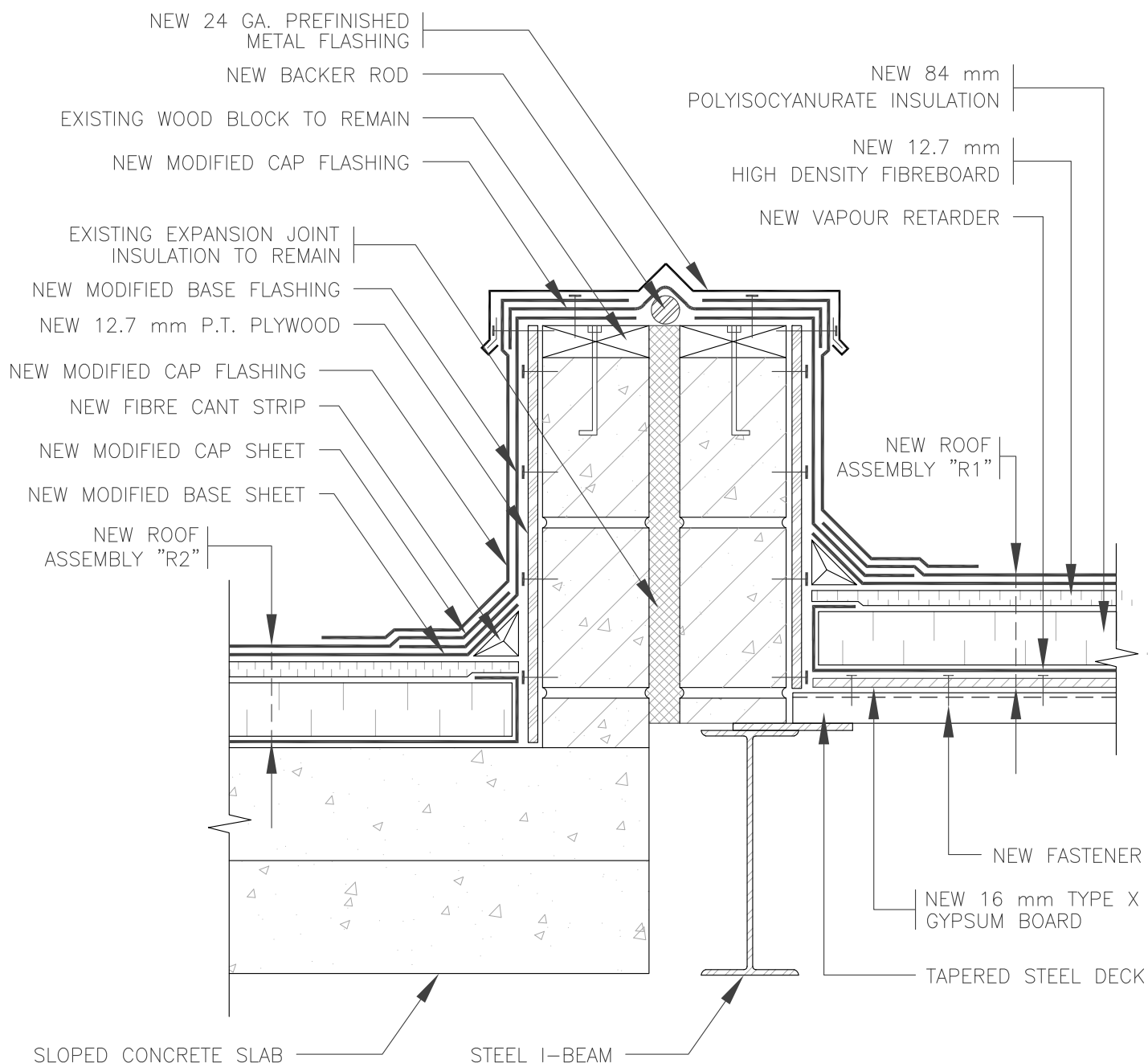
SCALE: N.T.S.

B. T. MARASHI, P. ENG.  
ACCENT BUILDING SCIENCES

DRAWN BY: H.S

**D2**

OF 7



SECTION 3-3  
N.T.S.

CLIENT:

CITY OF GUELPH  
59 CARDEN STREET  
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N1H 3A1



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PROJECT:

ROOF AND HEATING SYSTEM REPLACEMENT AT  
EVERGREEN SENIOR'S CENTRE  
683 WOOLWICH STREET  
GUELPH, ONTARIO

ROOF EXPANSION JOINT DETAIL

DATE: APRIL 2010

SCALE: N.T.S.

DRAWN BY: H.S.

APPROVED BY:

B. T. MARASHI, P. ENG.  
ACCENT BUILDING SCIENCES

**D3**

OF 7

EXISTING ROOF HATCH  
TO REMAIN

EXISTING METAL DRIP EDGE TO REMAIN

NEW 24 GA. PREFINISHED  
METAL FLASHING

NEW MODIFIED CAP FLASHING

NEW MODIFIED BASE FLASHING

NEW 12.7 mm P.T. PLYWOOD

NEW FIBRE CANT STRIP

NEW ROOF ASSEMBLY "R1"

EXISTING WOOD  
BLOCK TO REMAIN

NEW FASTENER

EXISTING TAPERED STEEL DECK

EXISTING CONCRETE BLOCK WALL

SECTION 4-4  
N.T.S.

CLIENT:

CITY OF GUELPH  
59 CARDEN STREET  
GUELPH, ONTARIO  
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PROJECT:

ROOF AND HEATING SYSTEM REPLACEMENT AT  
EVERGREEN SENIOR'S CENTRE  
683 WOOLWICH STREET  
GUELPH, ONTARIO

ROOF HATCH DETAIL

DATE: APRIL 2010

SCALE: N.T.S.

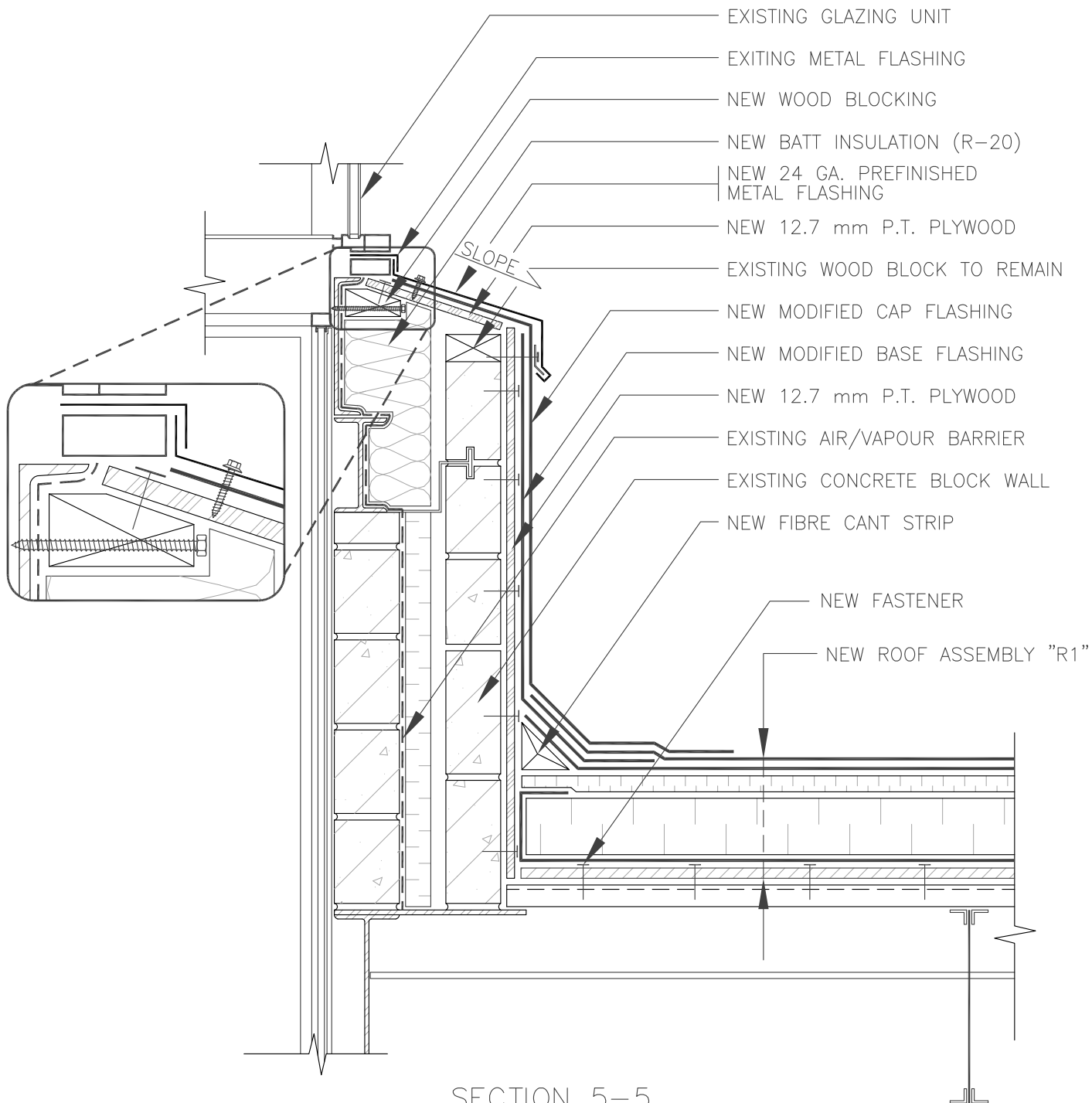
DRAWN BY: H.S

APPROVED BY:

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ACCENT BUILDING SCIENCES

D4

OF 7



SECTION 5-5  
N.T.S.

CLIENT:

CITY OF GUELPH

59 CARDEN STREET  
GUELPH, ONTARIO  
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PROJECT:

ROOF AND HEATING SYSTEM REPLACEMENT AT  
EVERGREEN SENIOR'S CENTRE

683 WOOLWICH STREET  
GUELPH, ONTARIO

SKY LIGHT TO ROOF DETAIL

DATE: APRIL 2010

SCALE: N.T.S.

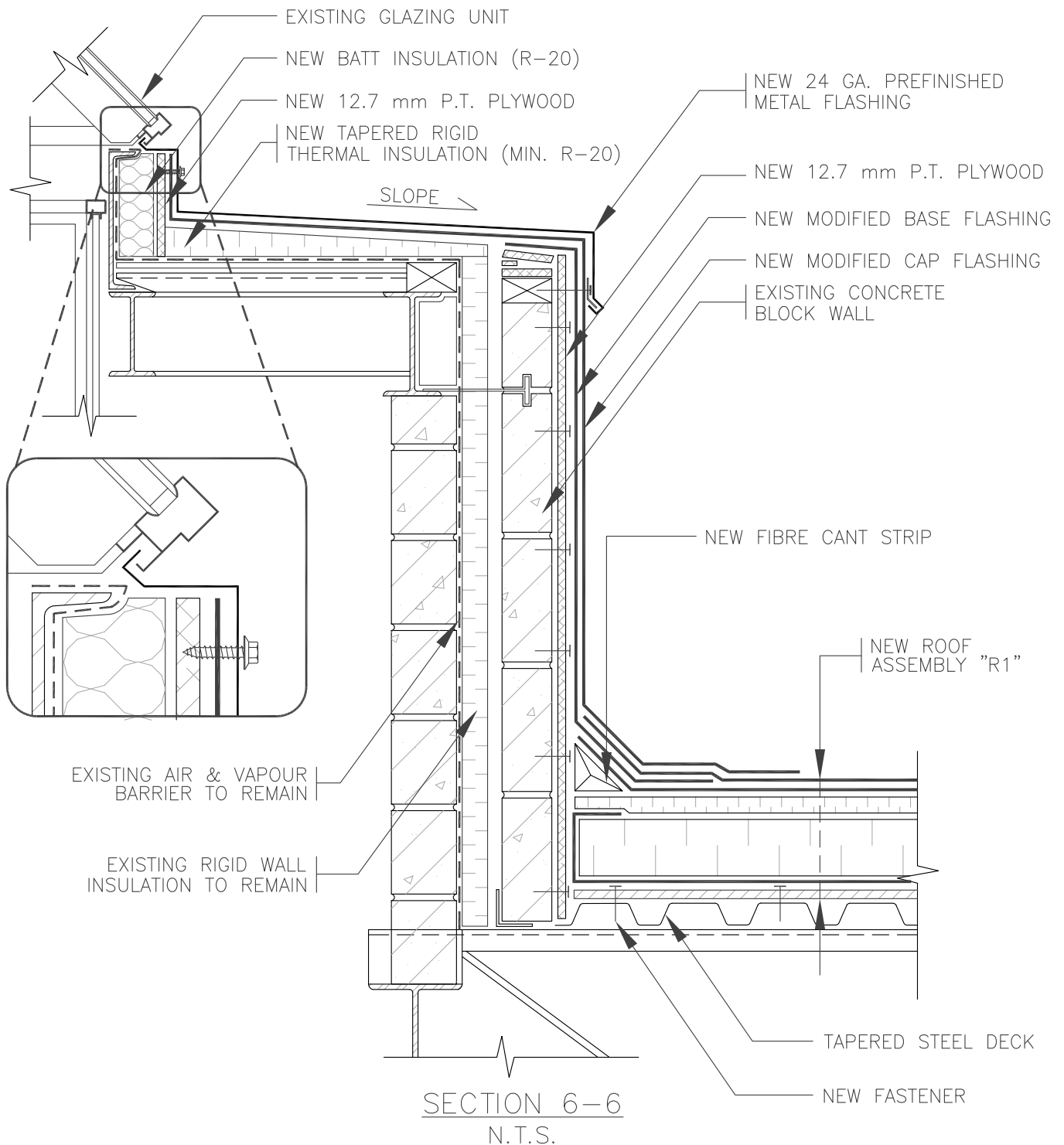
DRAWN BY: H.S.

APPROVED BY:

B. T. MARASHI, P. ENG.  
ACCENT BUILDING SCIENCES

D5

OF 7



CLIENT:

CITY OF GUELPH  
59 CARDEN STREET  
GUELPH, ONTARIO  
N1H 3A1



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TORONTO, ONTARIO M1X 1N4  
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E-mail: accent@buildingsciences.net  
www.buildingsciences.net

PROJECT:

ROOF AND HEATING SYSTEM REPLACEMENT AT  
EVERGREEN SENIOR'S CENTRE  
683 WOOLWICH STREET  
GUELPH, ONTARIO

SKYLIGHT TO ROOF DETAIL

DATE: APRIL 2010

APPROVED BY:

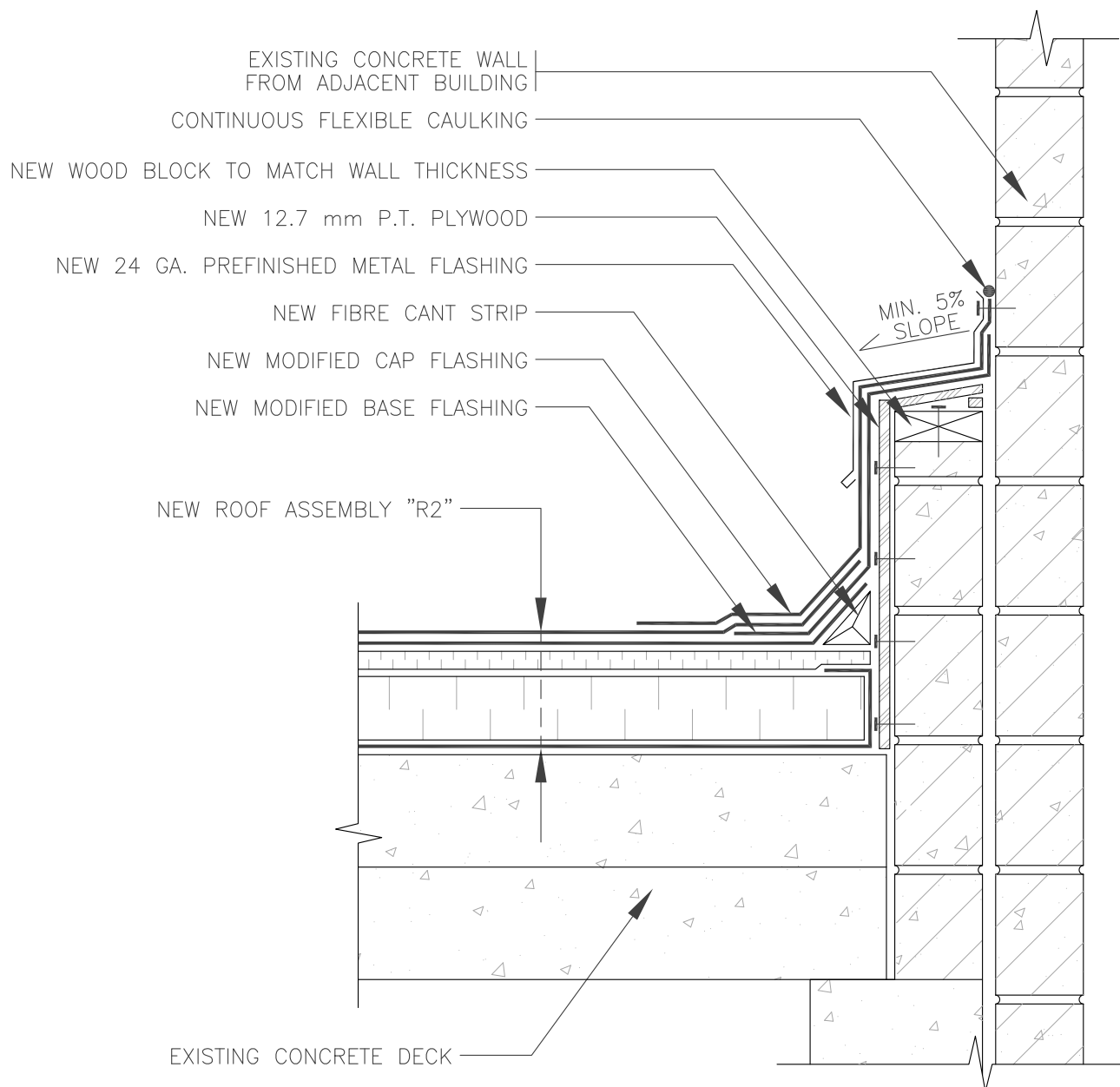
SCALE: N.T.S.

B. T. MARASHI, P. ENG.  
ACCENT BUILDING SCIENCES

DRAWN BY: H.S.

**D6**

OF 7



SECTION 7-7  
N.T.S.

CLIENT:

CITY OF GUELPH  
59 CARDEN STREET  
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PROJECT:

ROOF AND HEATING SYSTEM REPLACEMENT AT  
EVERGREEN SENIOR'S CENTRE  
683 WOOLWICH STREET  
GUELPH, ONTARIO

ADJACENT BUILDING TO ROOF DETAIL

DATE: APRIL 2010

SCALE: N.T.S.

DRAWN BY: H.S.

APPROVED BY:

B. T. MARASHI, P. ENG.  
ACCENT BUILDING SCIENCES

**D7**

OF 7

### **Scope of work**

1. The complete removal and disposal of all roofing component and/or layers down to the existing structural decking, and the installation of a new Two (2) Ply Modified Bituminous Roofing Membrane as per specifications and drawings on flat roof sections A, B and D.
2. Install two base coats of Rust-Oleum Mathys Noxyde™ / Acrylic Enamel and one finish coat of ICI Weathergard on the sloped metal roof of the gymnasium, (section C).
3. Replace six (6) existing rooftop gas fired ventilation units, each with heating and cooling. Replace the roof curbs, ductwork, electrical, controls, and other services.
4. Replace and expand existing building automation system.